

BIMarabia

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September 2017

Green Buildings

Green BIM

**Software
infrastructure
in the modeling
system**

Tables Lookup

**Mathematical Relationships
in Dynamo**

Words in the LOD

Doha BIM Users Group

What the American architect and American Institute of Architects fellow Phil Bernstein did in that day was extraordinary, he sat in his office dropped head thinking deeply until his mind emerged something unique in the field of architecture and was the first to use it, when his colleague (Jerry Laiserin) came latter and helped spreading and circulating it...

Phil was not aware that this innovation would one day find its way to proliferation...

He did not realize that his innovation would have anything to do with the world of buildings...

He did not realize that his invention would pave the way for radical, non-linear solutions such as saving time and eliminating material wastage, and securing buildings sustainability...

He also did not realize that his innovation would make everyone wrap around that world and pursue him with all power they got...

Including the ingenious engineer who wrote the first code for Macintosh OS from his office in Budapest (Hungary) within the Graphisoft building in 1982 to announce the birth of Archicad that enabled its users to manipulate library elements depending on a database fed to it, the thing that made the difference compared to AutoCAD, later Revit came to coupe up and eventually breakthrough them all.

At the end, he did not even realize that his innovation would be the point of interest to everyone in the industry, including us through our first Arab magazine, which talks about his innovation

(Building Information Modeling)

We wish you a good read in the eighth issue of the magazine through new topics and interesting information...

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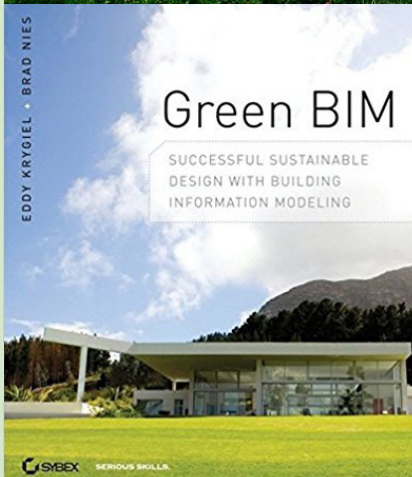
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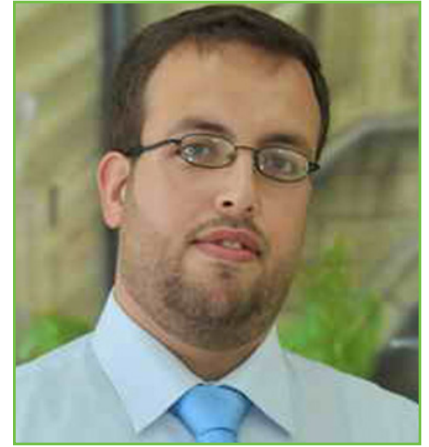
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Green Buildings

definition,
the importance, rating
systems,
and strategies



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The concept of sustainability

Sustainability and better life for next generations is one of the basic concepts which construction professionals attempt to apply its urban and industrial technology and strategy, which is accompanied by greater consumption of natural resources and energy, thus negatively impacts the ability of the planet to replenish its resources. The future life is in danger.

Hence, sustainability is defined as the ability to meet the needs of the present without affecting the ability of insurance to the needs of future generations. It requires natural resources to be used at

a rate where the nature can replenish the resources consumed and mitigate the environmental pollution caused by human activities.

Sustainability is based on three basic pillars, and it is only in keeping with its variables: economy, society and the environment.

Sustainability can be represented in a deeper way by a triangle who's hinges are objectives of sustainability and its sides are the pillars. The environment is the base of the triangle because strong sustainability is the environment-centered one.



- Probability (bearable) between society and the environment.
- Efficiency (viable) between environment and economy.
- Equality (equitable) between society and the economy.



Energy consumption is the main influence on these pillars. Therefore, reducing energy consumption is a general responsibility for all individuals and institutions of the societies.

Let's start with the so-called "energy pyramid" which aims to reduce energy consumption:

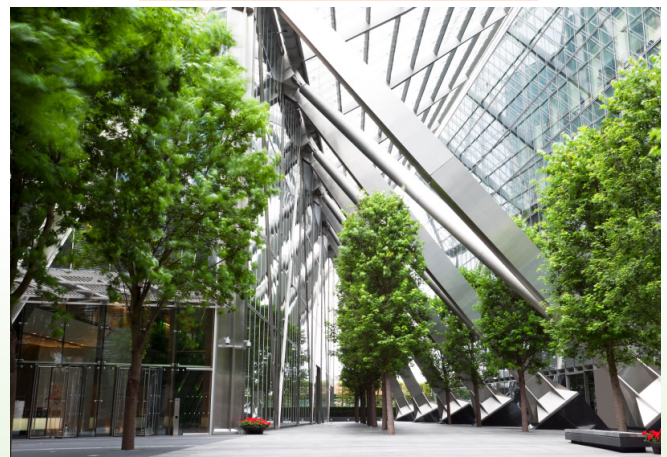
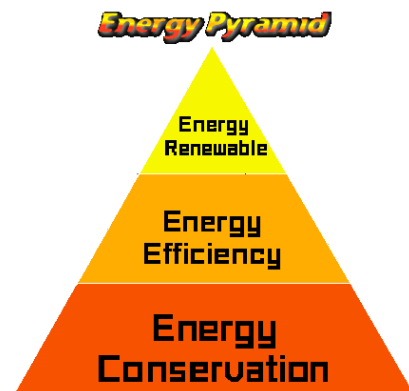
- **Energy Conservation** : Reduce energy use as much as possible
- **Energy Efficiency**: Use energy efficiently
- **Renewable Energy**: find alternative and different solutions like Renewable Energy

The concept of Sustainable Architecture or Green Architecture is a general term that describes environmentally conscious design techniques in the field of architecture, the design of buildings in an environment-friendly manner, taking into account the reduction of energy consumption, materials and resources while minimizing the effects of construction and use on the environment .

Today's enthusiasm for green architecture and sustainable buildings has its origins in the energy crisis of the 1970s. Architects then began to wonder about the existence of glass and steel box buildings requiring massive heating and costly cooling systems, and from there, the voices of enthusiastic architects

who suggested the most efficient architecture in energy consumption were available.

With the increase in global warming and its impact on the ozone layer and desertification as well as the entry into force of raw materials of minerals and fuel in the world, besides the increase in the world population and hence the increase in energy demand and water consumption, all these causes made the countries to adopt the idea of sustainability and green buildings.



Green Buildings

Green buildings represent the buildings that provide a better life for the human being and take into consideration the environmental standards at every stage of the construction, design, implementation, operation and maintenance, thus reducing the harmful environmental impact of the building on society and the planet in general.

The green buildings are integrated system, contribute through its ability to save electricity and water consumption and reduce the energy that used for cooling and heating water ... to increase the life of the building and to improve human health and the preservation of the ecosystem, which reflects positively on the economy and productivity.

The main difference between green buildings and traditional buildings is the concept of integration. A multidisciplinary team of construction professionals work together from pre-design to post-housing to improve the environmental sustainability of the building, improve performance and save costs.

Green buildings offer many benefits to the construction industry, including the residents of the buildings and the community as a whole. Green buildings typically include better air quality, abundant natural lighting, availability of views and noise control, making these buildings a better place to work or live.

It also benefits from as little materials as possible, through good design and attention to removing unnecessary materials in finishes. In addition, the construction of these buildings saves the use of materials as well as water recycling.



Green Building Rating Systems

There is more than one rating System for green buildings, including local codes that are applied in many countries and are suited to the conditions of each country. The most famous global systems are:

1. Leadership in Energy and Environmental Design or **LEED**. It was established in 2000 by the US Green Building Council (USGBC).

2. Building Research Establishment Environmental Assessment Methodology or **BREEAM**. It was established in 1990 by the British Building Research Foundation (BRE).

3. The ARZ Rating System. It was established in 2011 by the Lebanese Green Building Council (LGBC).

4. Estidama Rating System. It was established in 2008 by the Abu Dhabi Urban Planning Council (UPC).

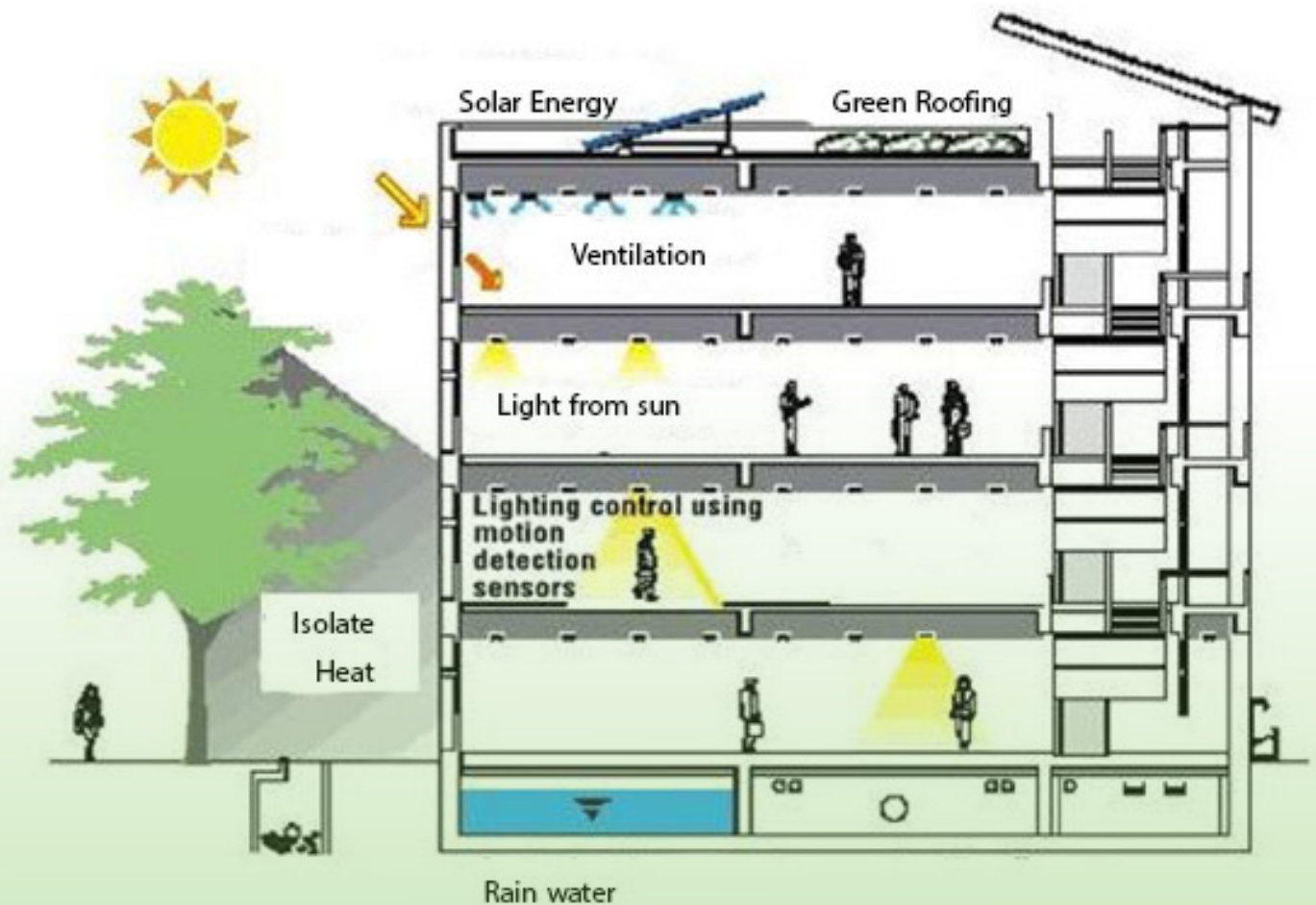
5. Green Star Rating System. It was established in 2003 by the Australian Green Building Council (GBCA).

6. Comprehensive Assessment System for Built Environment Efficiency. It was established in 2001 by the Japanese Green Building Council (JGBC).

USA	United Kingdom	Lebanon	Abu Dhabi (UAE)	Australia	Japan
					
					

In spite of the different and various systems of assessment of green buildings, but they focus on the same goals, and the objectives of green buildings are summarized as follows:

1. Use all resources of energy, water and materials effectively and reduce waste (principle of reduction, reuse and then recycling).
2. Preserve the nature that is the source of all resources.
3. Creating a healthy environment for future generations.
4. Design of buildings with high efficiency by balancing the performance, environment and resources in addition to focusing on the total cost of the lifecycle of the building and not the initial cost of construction.



Under these objectives, number of themes facilitate the monitoring and evaluation of design, construction and operation specifications, and can be summarized in six main themes:

- 1- Sustainable Site
- 2- Energy Efficiency
- 3- Water Efficiency
- 4- Materials Selection
- 5- Indoor Air Quality



First Theme: Sustainable Site

This theme depends on site selection based on the following factors:

1. Choosing the site of the building in a populated area where most of the centers of human requirements of education, hospitalization, medicine, food, sport, comfort and security ... to ensure a comfortable life for the person while reducing the use of transportation and focus on the use of bicycles and healthy walking.

2. Choosing the location of the building so that the maximum use of the surrounding environment to serve the environmental aspirations in terms of saving and mitigation of energy consumption in summer and winter through the use directly or indirectly from the surrounding environment as a path to the sun, shade and air direction during the year and benefit from them by lighting of the nature and relying on natural ventilation instead of mechanical ventilation and cooling and heating devices.

3. Reusing of buildings and abandoned sites to protect the land and minimize the impact of new urban expansions on the environment.

4. The development of the site by increasing the green area around the building, the use of green surfaces, in addition to increasing public green spaces.



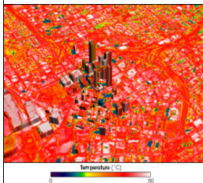


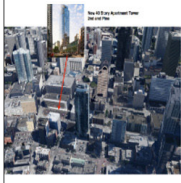
5. Avoid to build above the nature reserves and archaeological sites to protect them and preserve the heritage and civilization of the surrounding environment.

6. Encouraging the use of the centers of transport, such as, metro, train, bicycles and planning to be close to most of the surrounding buildings in addition to being close to the current transport routes. In addition, encouraging the use of environmentally friendly vehicles and to allocate a collective garage for these vehicles in order to encourage people to acquire them.

7. Reducing the pollution of light at night through the use of external lighting poles so that the beam of light is directed to the ground only and not scattered in the sky or to surrounding buildings, which leads to discomfort of the sleeping population and some animals and birds that are affected by light pollution during night.

8. Reducing heat island effect by using light-colored and heat-reflective asphalt roads, as well as, the use of surfaces on the roofs of the building and the sidewalks planted around the building, including spaces, which helps to reflect the heat and absorb water rain to which also reduces the pollution of running water on the sidewalks during rainfall.

9. Spreading a culture of encouraging people and employees to accompany their colleagues in one car to reach or leave their place and the exchange of roles among them every day (Carpool) and to reduce the traffic congestion and pollutants from the multitude of cars in the roads.

Reducing the pollution of light	Encouraging the use of the centers of transport	Reducing heat island	Using green roofs	Increasing green spaces and landscape	Choosing suitable site
					

Second Theme: Energy Efficiency

Energy efficiency is one of the most important factors in the design of green buildings and especially (BIM, Building Information Modeling), but as an important and wide-ranging topic, I will talk about it in future issues of the magazine. To achieve energy efficiency, the following factors should be used:

1. Energy Modeling, which is important because it gives us a clear picture of the amount of electricity consumption of the building and how to consume between multiple electrical loads (lighting, electrical appliances, air conditioning and heating, pumps, water heating devices ... etc.) before the construction and this is the objective of basic energy modeling to allow us to change any parameter and the reflection on the rest of the loads of electricity. There are many programs that offer this technology and the most famous ones include Autodesk Revit, eQuest, Design Builder, IES , and EnergyPlus...etc.

2. Using Passive Design by indirectly utilizing the natural light according to the path of the sun during the year to reduce the energy consumption of electric lighting, as well as, natural ventilation by identifying the speed and direction of wind around the building during the year. And this allows us to direct the building in the optimal direction of natural ventilation instead of using air conditioning, heating and power consumption. There are engineering softwares that provide both Daylight Simulation and Wind Analysis.

3. Using Fluid Dynamic Computing (CFD) technology in the distribution of air inside the room in such a way to optimize the distribution of air conditioning or heating openings, thus reducing the consumption of electrical energy from the air conditioning, heating and cooling due to its operation at maximum efficiency.

4. Using high-efficiency lighting, including the use of LED instead of normal lamps and the use of fluorescent lamps T4 / T5 instead of T8, and using Occupancy Sensor in the corridors, stairs and rooms so as to give order to turn on the light in the presence of a person in the place. In addition, using the Daylight Sensor to control the light level of the electric lighting so that the light is adjusted according to the level of natural light in place. Use of Light Automation which reduces the energy consumption of the lighting.

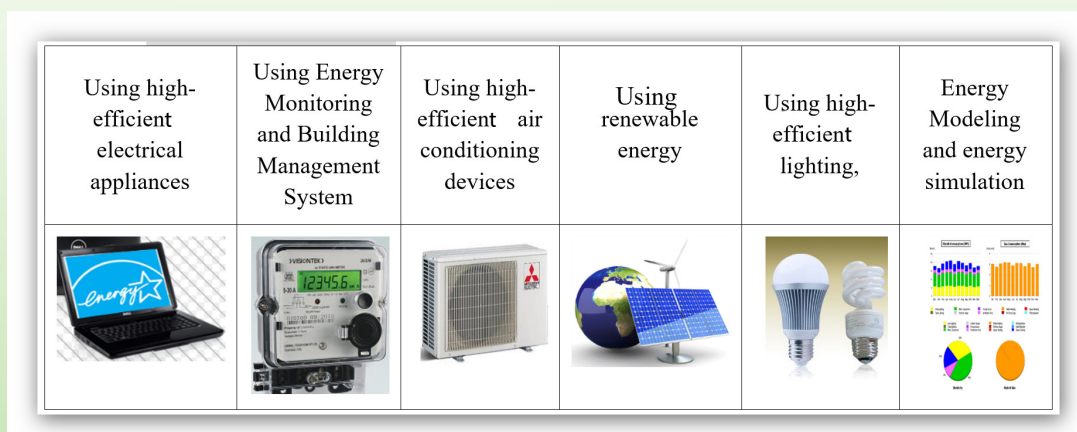
5. Reducing the energy consumption of air conditioning and heating through the selection of high-efficiency devices, which have the highest performance (COP, Coefficient of Performance). The precise selection of windows, good insulation of walls and ceilings to maintain air temperature inside the room and prevent air leakage between outside and inside the room. The use of walls and ceilings with light and reflective sunlight colors, which reduces the absorption of sunlight, isolation of air conditioning pipes, the correct placement of moisture and air insulators. The use of Variable Air Volume (VAV) technology, as well as, the use of Variable Refrigerant Flow (VRF) technology. VFD, Variable Frequency Drive (VFD) is used for air conditioning motors so that engine rotation speed is controlled as needed, which is reflected positively in reducing the power consumption of engines.

6. Using high efficient electrical appliances (laptop, fridge, washing machine, TV, etc.) with labels, such as, the Energy Star label, which symbolizes that these devices consume less electricity than others.

7. The use of renewable energy, such as, wind power, solar energy or underground geothermal energy, to meet energy requirements greatly reduces the carbon footprint of these buildings.

8. Using Energy Monitoring and Building Management System (BMS) to avoid energy dissipation and consumption control. Smart control technology can be applied (local or central), making it easy to control the devices automatically or manually in the control room, as well as, energy consumption knowledge to adjust our energy consumption as needed.

9. Finally, using the Eco Friendly Refrigerant for the air conditioners in order to increase the efficiency of these devices and, more importantly, reduce the global warming and ozone depletion.



Third Theme: Water Efficiency

Green buildings emphasize on water conservation by using more efficient systems for pumping and reusing water, and Water Conservation. The most important water efficiency strategies are:

1. Reducing internal water consumption in the building through the use of water-saving sanitary equipment: Dual Flush Toilets, Waterless Urinals, Low Flow Shower Head. As well as, the use of water-saving mixers of all kinds.


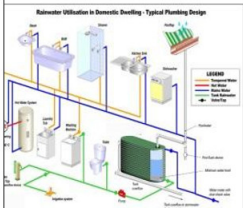




2. Using water-saving washing machines and dishwashers with Energy Star label on them.

3. Gray water: This can be defined as water from bathtubs, wash basins, drinking water springs, and water from air conditioners and refrigerators. And can be used directly for some applications such as irrigation, WC tank filling , cooling and industrial purposes and in the filling of latrines and fire extinguishers.

4. Using rainwater by collecting it from the roof and storing it in solid tanks for later use for irrigation purposes.

5. Effective management and water monitoring through the installation of water meters inside the building for health and external devices for the work of garden irrigation to know the consumption of water and therefore developing the strategy to saveour water consumption.

6. Using of modern technologies for high efficient irrigation systems, such as, drip irrigation, as well as an automatic control panel that can be programmed to give an order for the irrigation system to run at certain times pre-programmed or depending on the weather conditions. Choosing plants that do not need much water, use mulching around the plant to minimize water evaporation. Use rainwater stored for irrigation.

Using high-efficient irrigation systems	Using gray water	Using water-saving washing machines	use of water-saving mixers	Dual Flush Toilets	use of efficient mixers
					



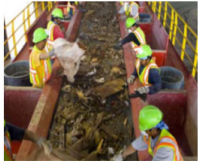



Fourth Theme: Materials and Waste Management

Green buildings emphasize the principle of reducing, reuse and recycling of materials and waste. The most important strategies:

1. Reduce construction and demolition waste of old buildings and encourage reuse of buildings, windows and doors in new buildings.
2. Reduce operational waste and recycling in order to reduce the total volume of the waste and thus save from the cost of disposal.
3. Sorting waste in a correct manner by placing containers for all waste of different colors in order to draw the attention of the population to the placement of some materials, such as, paper and cardboard in addition to other materials, such as, organic materials, metals and electronic devices in the containers allocated to them according to their colors.
4. Use of regional or local materials in the same geographical location as much as possible in order to reduce the import from distant places, which requires the use of ships and trucks that pollute the environment in addition to reducing the cost of transport.
5. The use of recycled materials or naturally renewable materials and non-use of

natural materials that need many years to grow again, in order to reduce the negative effects on the environment.

6. Use wood, paper or cardboard products with a symbol or label as recycling or environmentally friendly products instead of using new materials that consume more materials and thus increase waste.

Reuse of buildings, windows and doors in new buildings	Use products with a symbol or label as recycling	Sorting buildings' waste for future use	Using local materials	Sorting waste by containers' colors and waste's type	Use of recycled materials
					

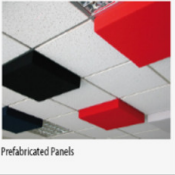





Fifth Theme: Indoor Environmental Quality

“IEQ”

The increasing in respiratory diseases, allergies, chemicals and gases released into the air has contributed to increase awareness of the importance of indoor air, as green buildings emphasize by improving indoor air by controlling, minimizing and eliminating sources of pollution through filtration. The most important strategies to improve the quality of the internal environment are:

- 1. Nonsmoking in public places and residential areas, and in the case of smoking must be allocated dedicated facilities and equipped with filters for air purification.
- 2. Keep the building dry from moisture and the use of insulating materials to prevent the leakage of moisture and dust and the proliferation of mold and germs.
- 3. Develop a periodic program to clean the building or house by cleaning tools.

4. Maintain hygiene by putting floor mats to prevent or reduce the entry of dirt that lead to air pollution.
5. Avoid using products containing (VOC, Volatile Organic Compound), which are found in paints, carpets, furniture and cleaning materials.
6. Prevent the use of paints, floors and roofs that contain volatile organic compound when exposed to high temperature.
7. Prevent the use of furniture containing formaldehyde ,in addition to prevent the use of products containing arsenic and asbestos, which lead to cancer.
8. Provide natural or mechanical ventilation of the building with air filters.
9. Close all openings around the electrical wiring and around the water pipes.
10. Provide ventilation for exhausts emitted from devices, such as, laser printers, cookers, bathrooms and public smoking areas.
11. Improve the temperature inside the room and allow people to modify the desired temperature through the thermostat of the systems of conditioning and heating.
12. Allow people to adjust the level of desired lighting within the room by controlling the level of internal light.
13. Use of natural lighting and the designing of glass facades oriented to the natural scenes in order to improve the mood, productivity and comfort of the population.
14. Reduce noise through control the barriers to sound, double glass and carpet, in addition to the use of absorbent noise materials and avoid the use of reflective materials that make the noise move longer distances.

use of absorbent noise materials	Avoid using products containing VOC	Use of natural lighting and the glass facades	Provide natural or mechanical ventilation	Allow people to adjust the level of lighting and heating	No smoking
 Prefabricated Panels					

Conclusion

To summarize the above, green buildings are not only structural and environmental sustainability, but offer many benefits and advantages to buildings' owners and users, the cost of construction and operation is low, with lower maintenance costs and a longer lifecycle, besides the available comfort and healthy interior environment, energy saving, reducing cost and pollution in the atmosphere. Therefore, each of us shall start and adopt the strategies of green buildings, even a small part of it in his home and to educate our children to become in the near future a culture and lifestyle that we follow and to save our earth planet ... So let us make our life green (So Go Green).





Building Information Modeling and related Green Architecture

Definition of Green Building is the building of sustainable design and Green Architecture, in terms of reducing the consumption of energy and water and reduces the percentage of carbon dioxide emission and provides thermal and light comfort for the building's users during the period of operation.

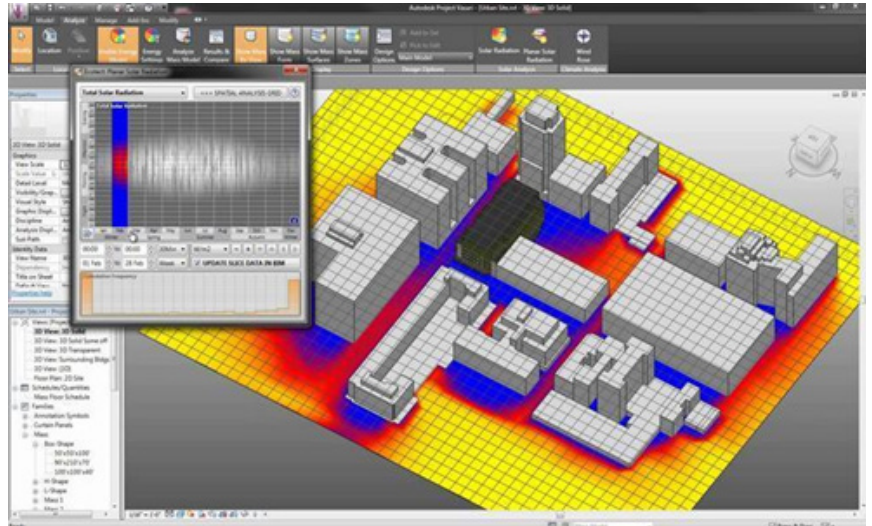
Strategy of Sustainable Architecture:

1. Reduce carbon dioxide.
2. Reduce the waste of internal energy from the processes of cooling or heating.
3. Exploitation of recycled materials.
4. Improving the internal ventilation efficiency of the internal space of the building.
5. Use electric power efficiency.
6. Use natural ventilation if possible.
7. Exploitation of the exterior of the landscape building.

1-Autodesk Vasari

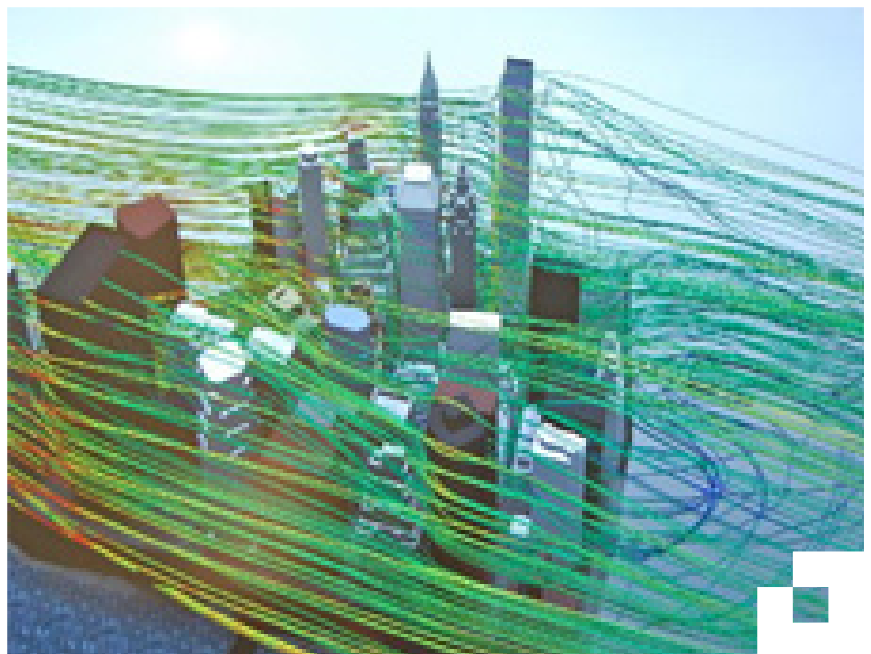
This program is characterized by ease of use and extraction of information, where the study of the movement of air between spaces in buildings and the movement of the sun and the intensity of solar brightness Solar Radiation and it is use in the rendering and ease of presentation, and advised by university students.

Green Architecture Software:



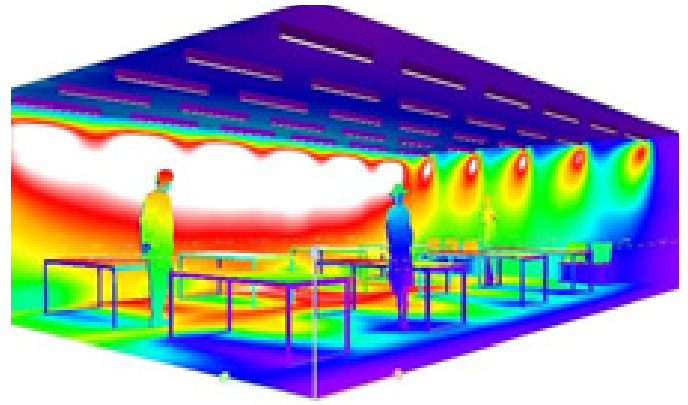
2-Autodesk CFD

It is a highly specialized program in the movement of air and high precision in the study of air movement in terms of air pressure and speed and temperature. In addition, it shows an analysis of the movement of fluids geometry or liquids movement.



3-Dialux

It is used by architectural and electrical engineers. It shows the result of the design, the distribution of lighting units in the buildings and inside the interior spaces; it helps to avoid dispersion, waste of lighting and emphasizes a better exploitation of lighting.



4-Design builder

It goes without definition, is studying the thermal loads of the building in terms of ventilation and the proportion of carbon dioxide emissions and the internal air movement, is studying of raw materials inside the building of the composition and insulation of heat and electricity loss rates. In the last edition the cost of electricity consumptions calculation (Energy consumption) and an identification certificate for the overall building efficiency was added.

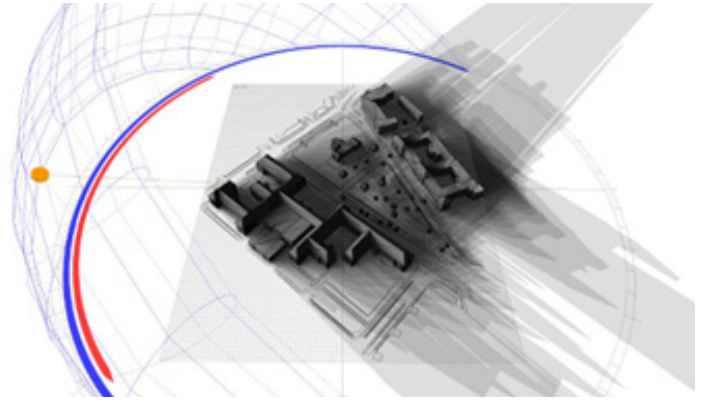


5- Green Building Studio

A program by Autodesk, which provides analysis of the building, the cost of electricity and water quantity for users and internal heat of the building, it is a Revit Add-in that gives a certificate of assessment of the building percentage of the LEED

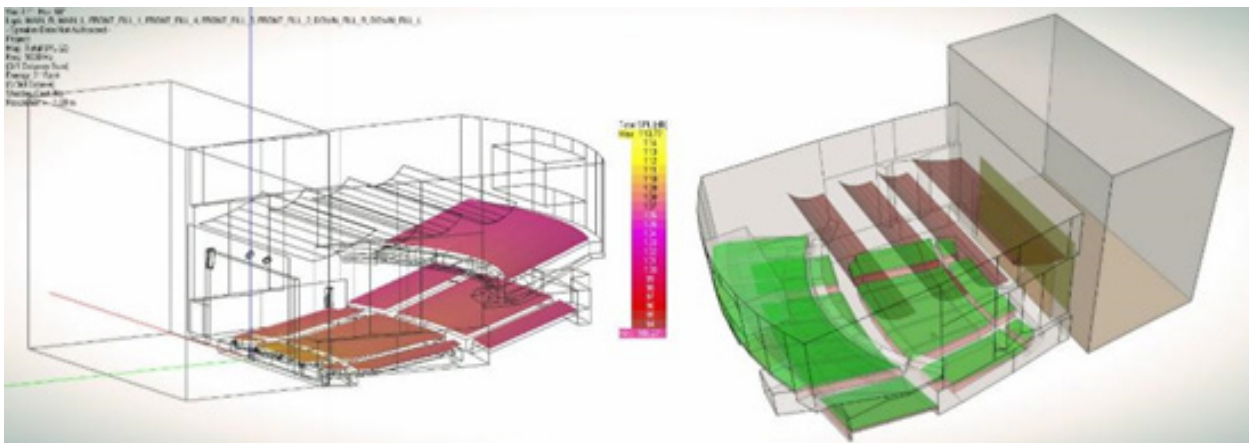
6-Autodesk Ecotect

From easy-to-use software distinguished from other programs by showing the form of shadow throughout the year, it makes assumptions to form sun barker to improve the building performance and avoid high temperature and direct lighting



7-Ease

One of the important softwares to design the cinemas and theaters, which analyzes for sound, frequency and vibration rebounds within architectural spaces to avoid sound echo and improve sound efficiency.



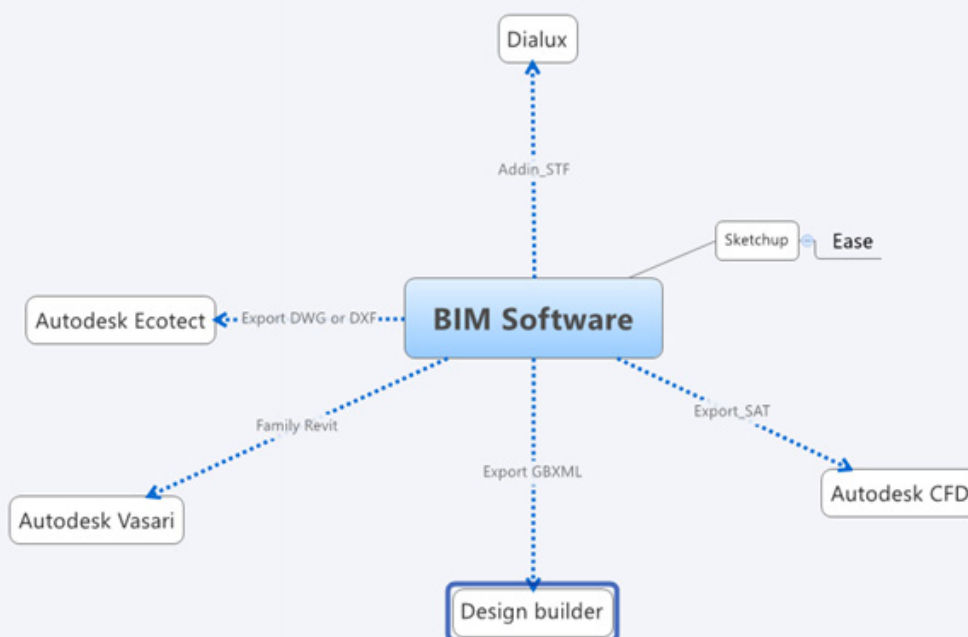
Project stages and how to manage them with Green BIM

- 1 - Site analysis.
- 2 - Design standards in the composition of the building and design if it is residential, commercial or service building.
- 3 - The study of climatic conditions by climate consulting software.
- 4 - Study the building materials available in the construction area. In order to provide existing means of transport and reduce the waste of mobility problems.

Building Rating or Certification System

- 1-Energy Star
- 2-Leadership in Energy and Environmental Design (LEED)
- 3-Green Globes
- 4-Living Building Challenge
- 5-Beam
- 6-BREEAM
- 7-CASBEE
- 8-Green Mark Scheme
- 9-Green Star SA

- 10-Pearl Rating System for Estidama
- 11-GSAS: Global Sustainability Assessment System
- 12-GPRS: Green Pyramid Rating System



Infrastructure Software in the Modeling System

When talking about modeling, there is a lot of talk about the construction field, while much of the importance of modeling in infrastructure and roads is missing.

The most versatile and most important in terms of its direct link to projects with large areas and the factor of time and quality and the calculation of quantities has a significant impact in them.

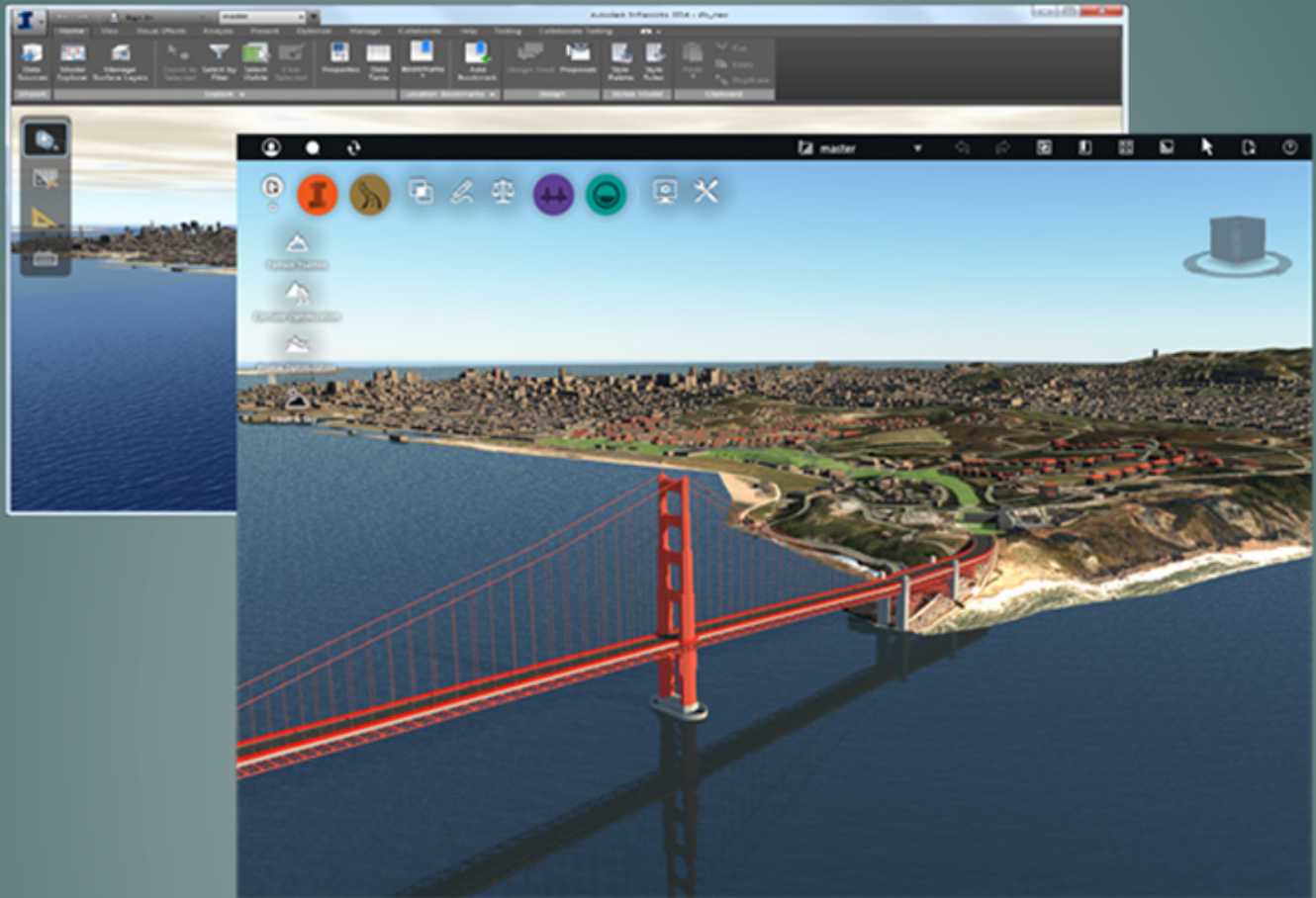


Amer Hijazi



Muhammad Etman

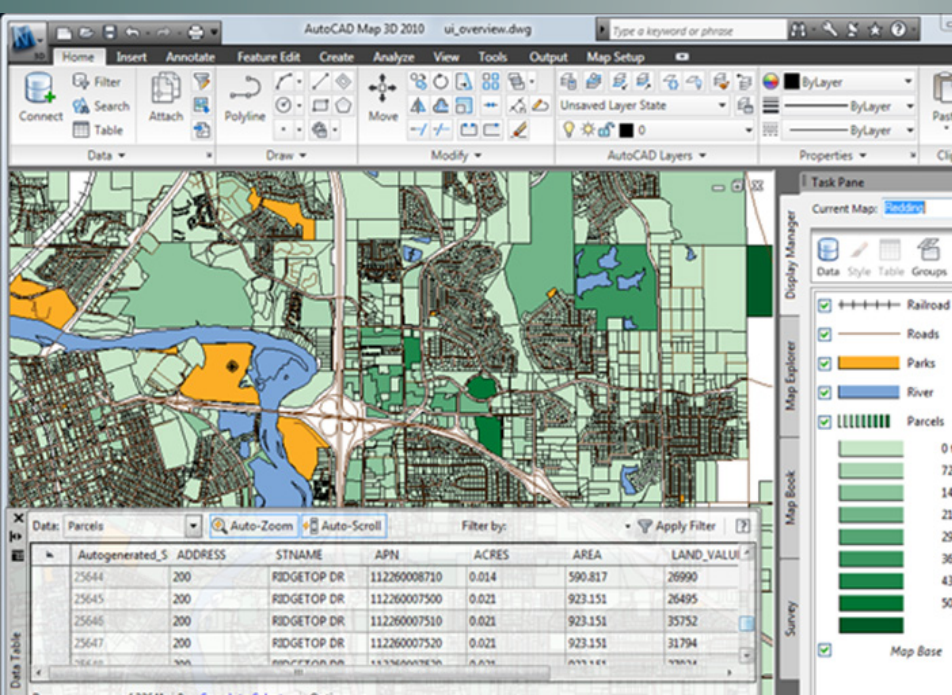
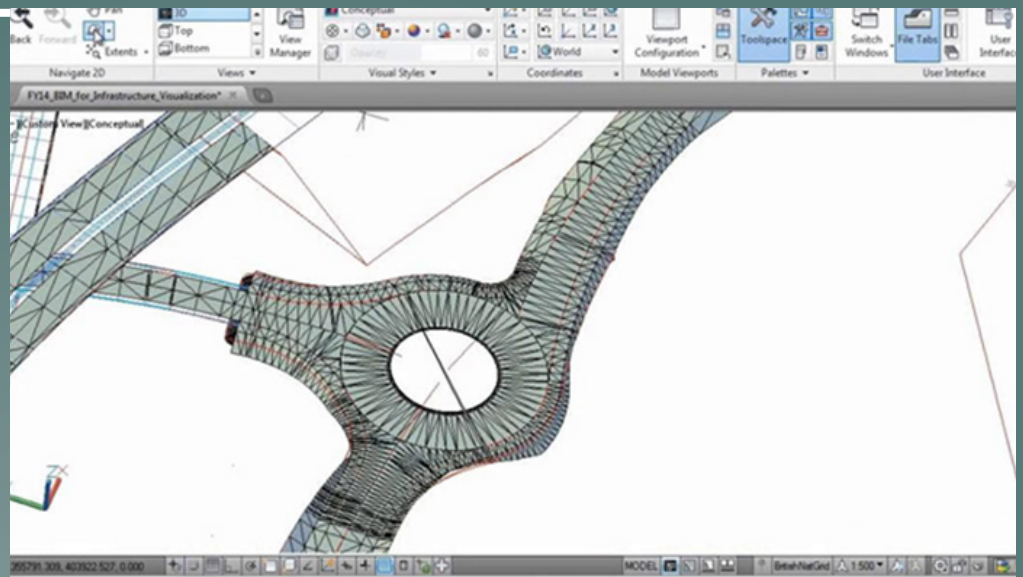
In this article, we will address several softwares and methods that support the modeling of infrastructure :



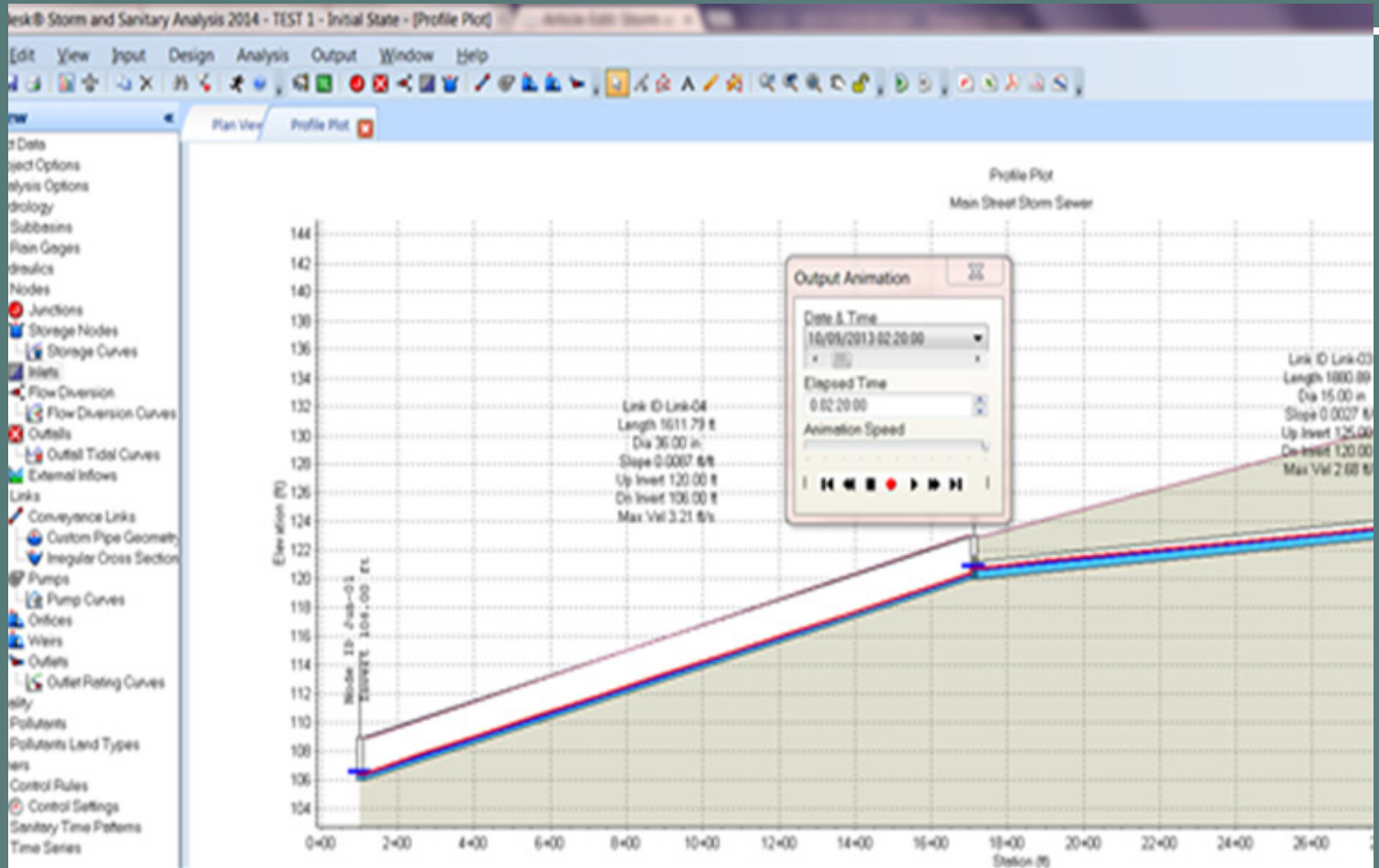
1. Design concept of the project LOD100: Here highlights the program 360 Infracore a program that constitutes a quantum leap in how to deal with the reality of the project, and building design idea based on spatial information and accurate cadaster and closest to the reality of any cost, and it also features the quality of the final exit from where information, to take advantage of the next stages of the project, as well as video presentation of the project for marketing purposes and deal with all parties to the project and understand the idea, it should be noted that it covers the requirements, Water concept study, urban planning ,civil work & landscape design ,bridge .

2. Detailed project design phase LOD 200 to 400: at this stage starts from the first phase of the program, 360 Infraworks and go to work within the following design software;

- In the area of urban development and roads through the program of Civil 3D is the largest ever in terms of design, precision, and also the preparation of schemes, the most important factor is the identification and accounting of assigned amounts accurately and dynamically.



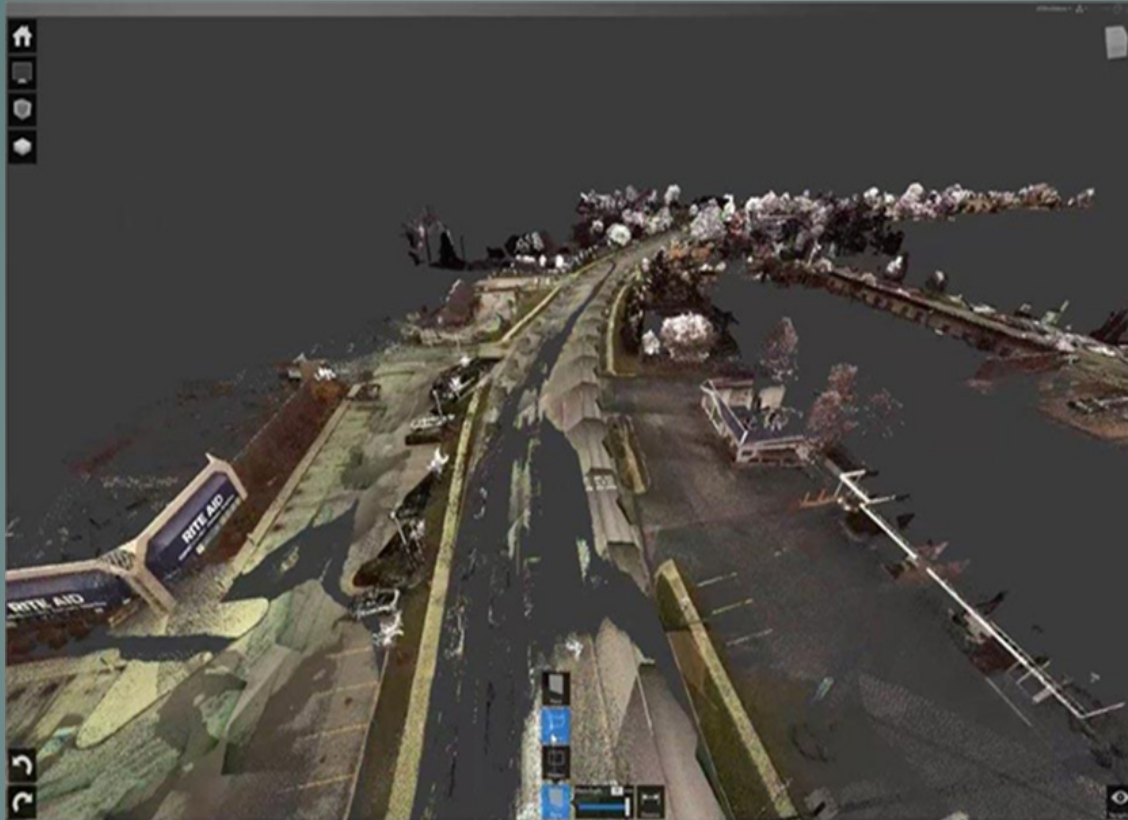
- In the field of survey work, we find Autodesk Map, which provides all the work of cadastral accurately and providing a variety of methods to deal with the project and understands the data and provides services and cadastral charts in a very accurate way.



- In the design of water, sewage and rain water drainage networks program Storm and Sanitary Analysis.
- Lighting projects in the streets, electrical and communications installations Utility program by Autodesk offers a harmonious design environment that interacts with all the previous programs to be embedded in the design of urban development.

In the fourth dimension stages and the presentation stages of the project, the engine and the executables can be worked within the software Infraworks 360 as well as Navisworks software, it should be noted that this software interact with more than one program, which provides a wonderful opportunity to present the dynamic presentation and the construction of the fourth dimension very accurately, the works of the site shall be noted as well to ensure the existence of collisions between the parties to the project in infrastructure, especially water and sanitation networks, projects can work accurately within Naviswork the Civi 3D.

There are also many software programs in the infrastructure that specialize in the work and understand the real environment of the project, including ReCap, which is one of the most advanced and modern programs in the field of scanning as a picture and a model used in the design work. As well as a tracking program that offers many design options for vehicle paths as well as aircraft.



Mathematical Relationships in

Dynamo

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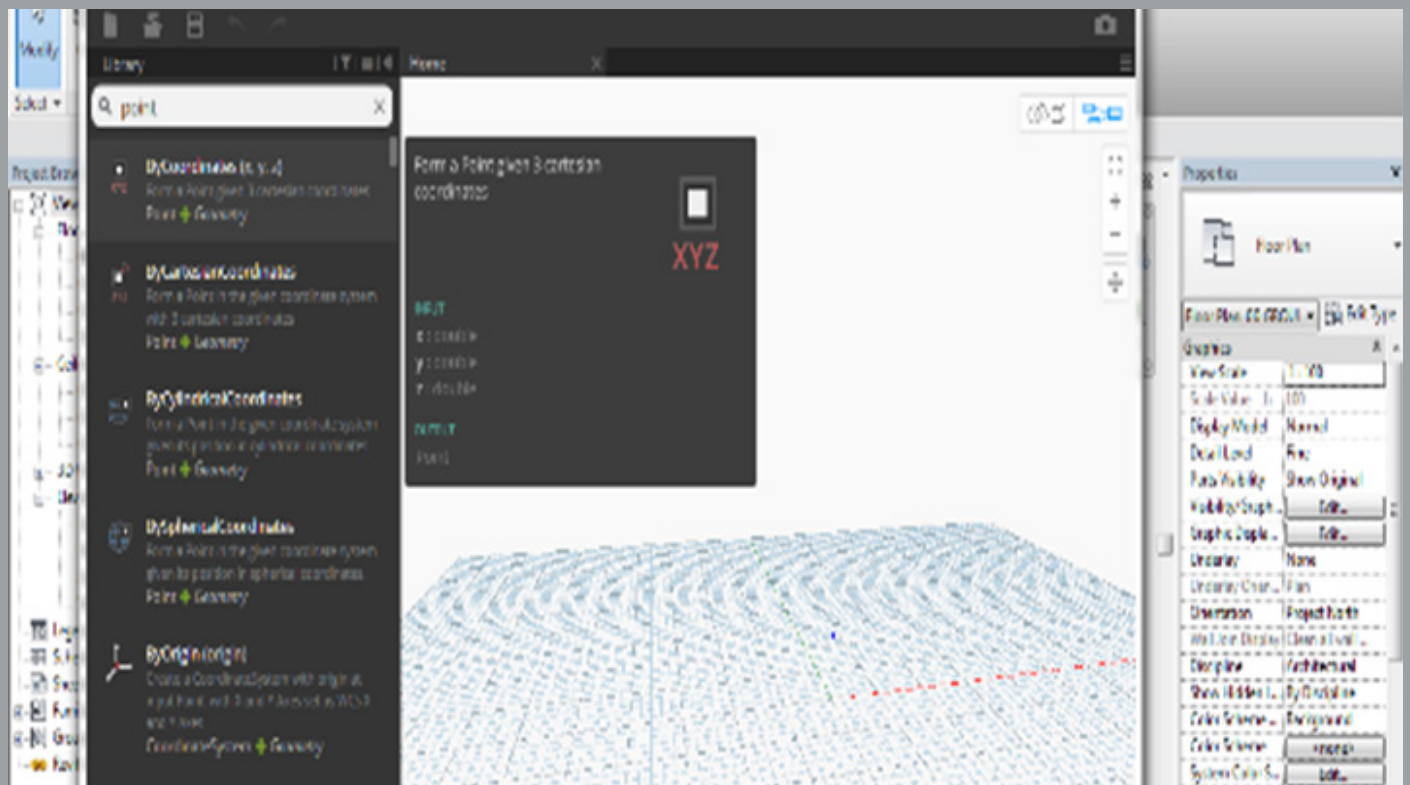
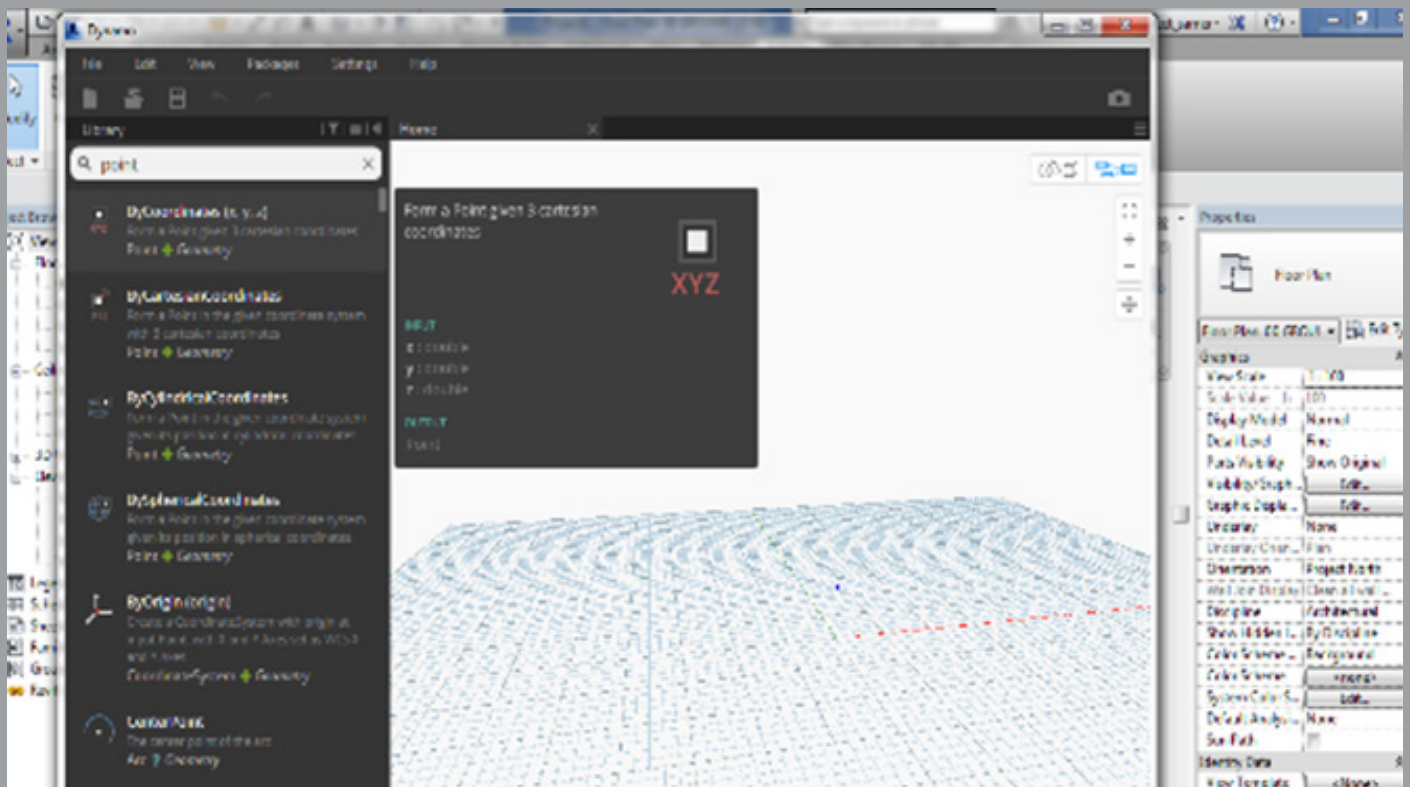
(2nd lesson)

Dynamo is one of the rapid evolution shapes in architecture & design, it's the connection between the BIM and the complicated parametric design that will enable us to use BIM's advantages with parametric design. We are about to learn the 2nd lesson in learning dynamo and it's about how to draw surfaces by using mathematical relationships and importing them into Revit.

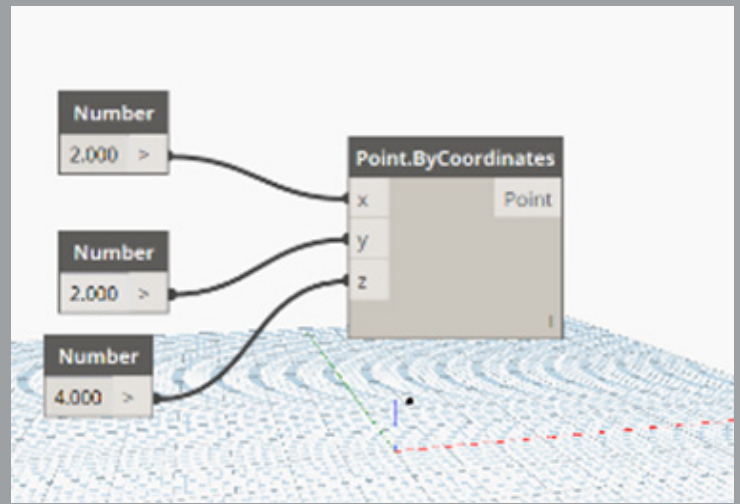
We will redo some of the steps that we already explained in the previous lesson (1st lesson) to go on the new lesson & it's recommended to revise the previous lesson before we start the new one.

1. Search using the search bar for point & chose the "Point by coordinates X,Y,Z" option, you will have a point in the file an undefined point so we have to specify the coordinates of this point.

2. In the second step we will add an element called Number to define the 3 coordinates X,Y,Z and we will also need 3 other points to define our 3 axis (X,Y,Z)

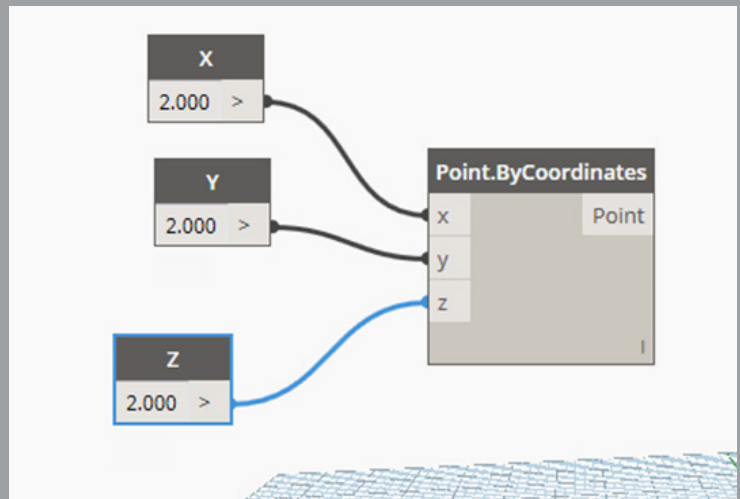


3. After placing the point we can copy , paste it by pressing ctrl + C then Ctrl + V 3 times, the point will appear in the middle of the file and you can move it by the numbers assigned to the point



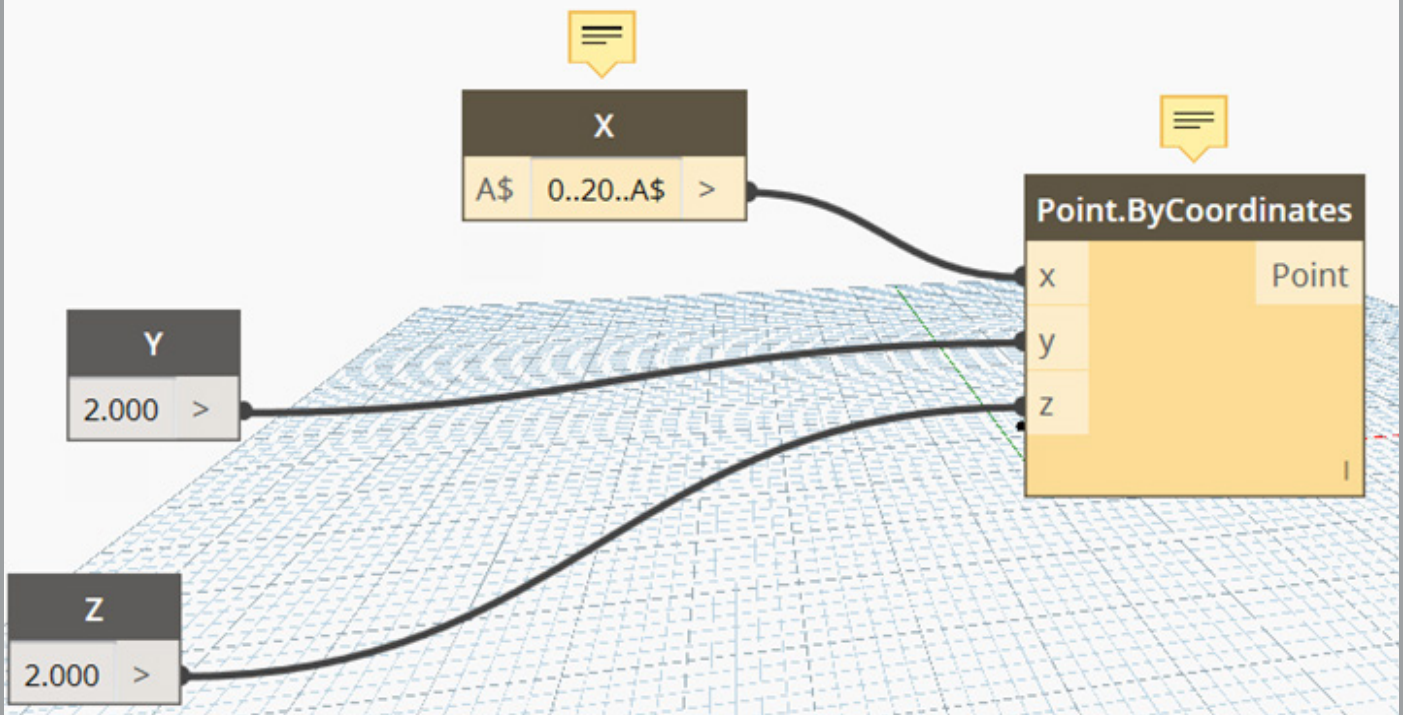
4. The next step is renaming the points to know the job of each point specially if the number of the points increased drastically & the file got complicated so it will be better to name each point. we can do this by right clicking the point and select **Rename Node** from the menu & change the first point name to be **X**.

5- with the same method rename the other points on series to be **X,Y,Z**



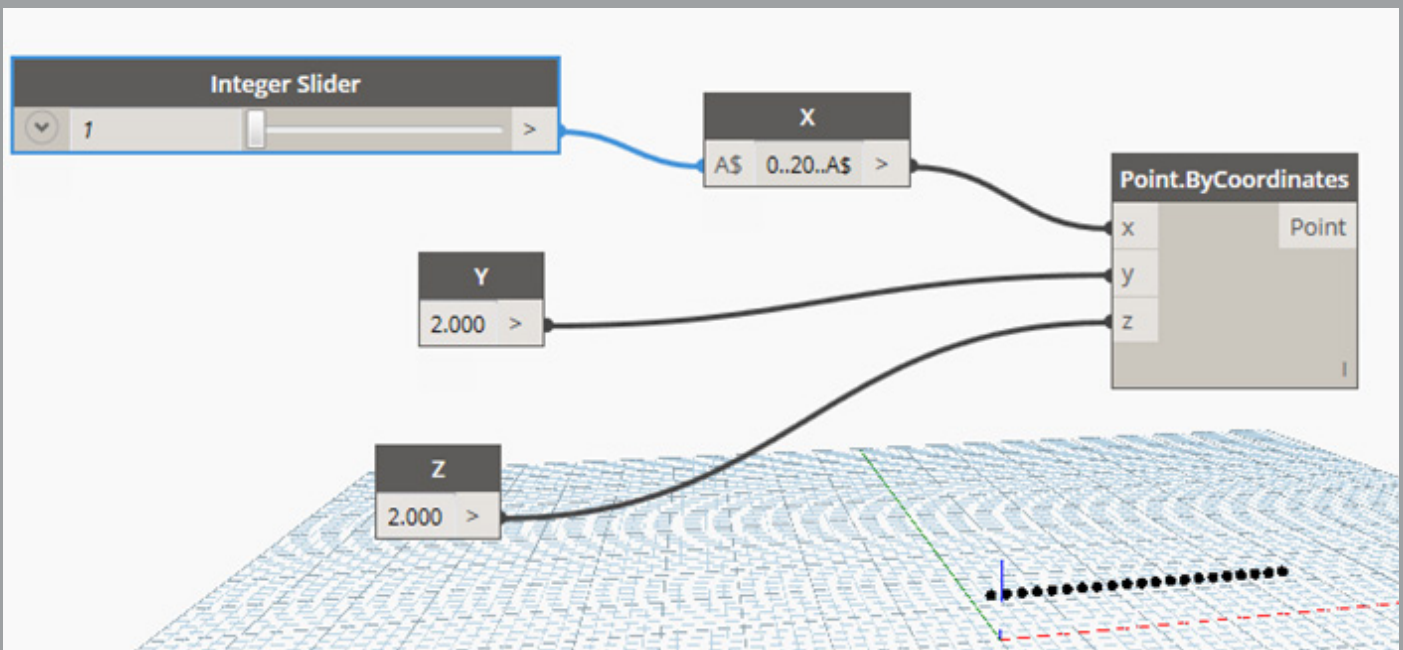
6. Now we want to make a group of points in the same direction of X-Axis

7. We will click on the X-value & type 0..20..A\$ as its shown in the following picture



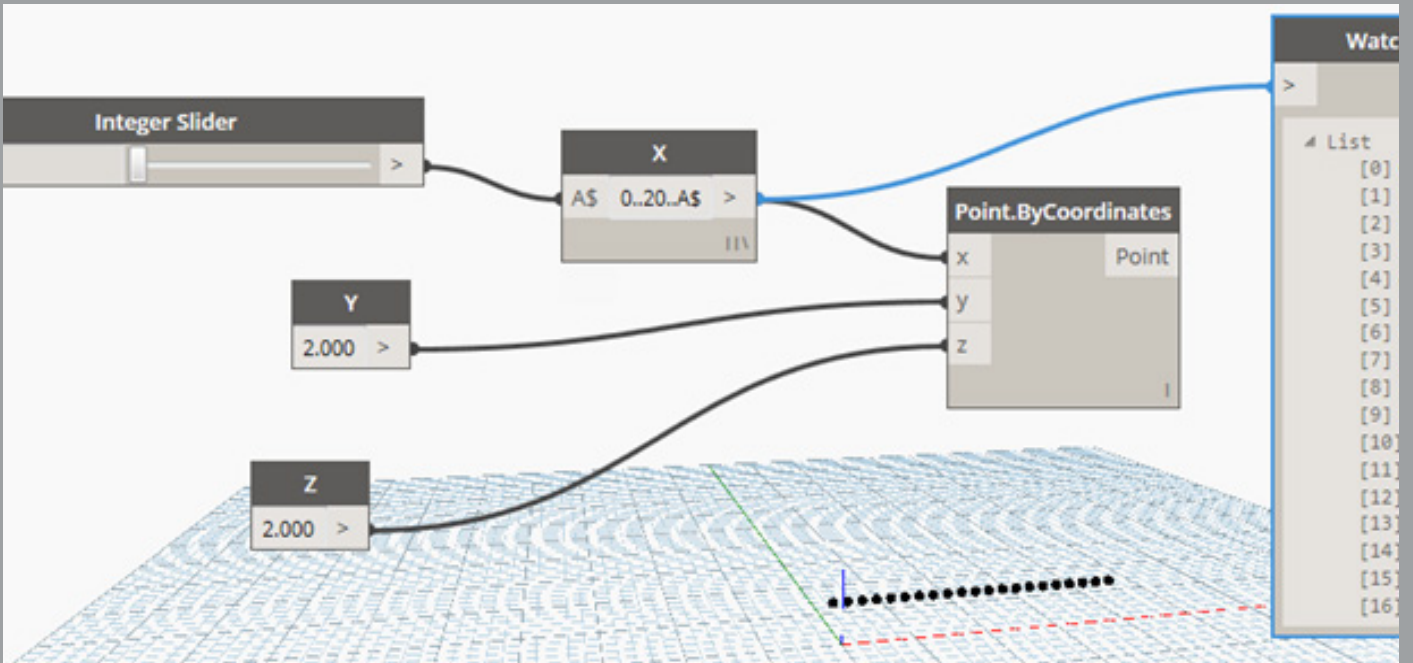
8. The node will now change its color to pale yellow & that's an indication of an error in dynamo orders. This was caused by the program now knowing how to copy the points & how to place them.

9. To fix this error we will add Integer slider that we learned in the previous lesson for the point X.



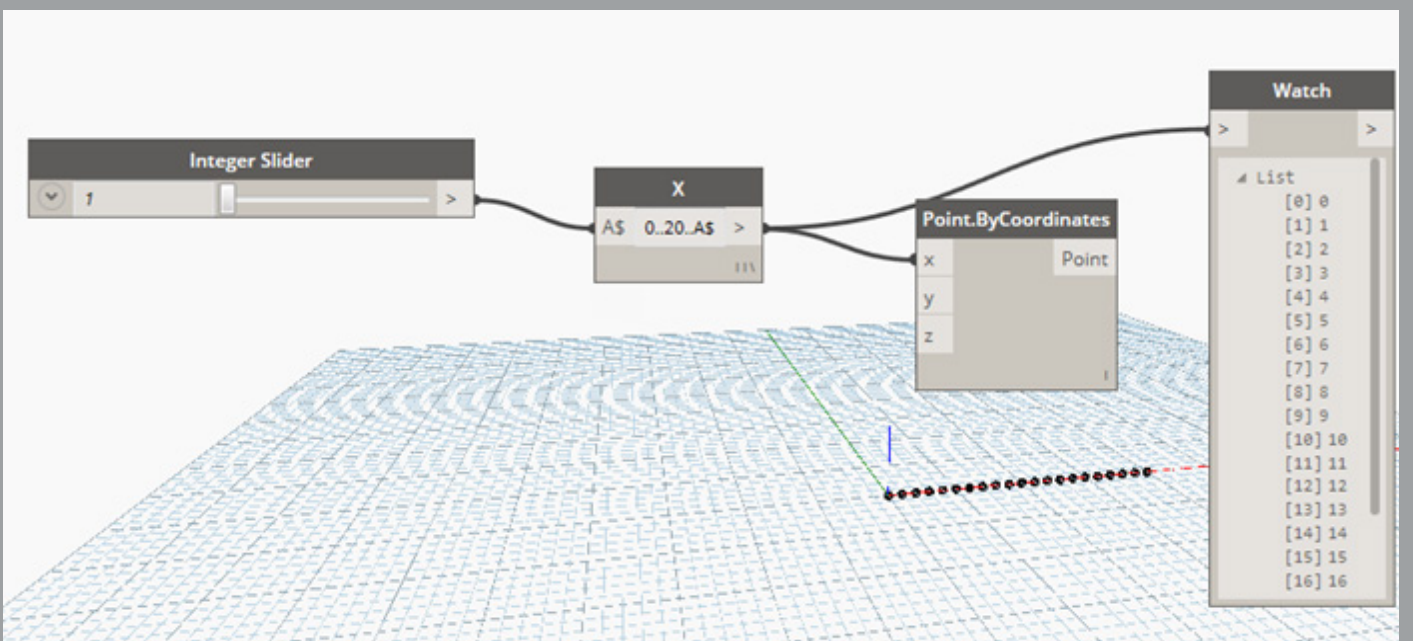
10. We make sure that the integer slider is set on 1 & we will find that copying went smoothly, we also notice that the more we increase the number the fewer number of points gradually becomes.

11. We can also use an important order to show and list all the points using the node Watch and connect the previous points by this order. We will find them added as shown.

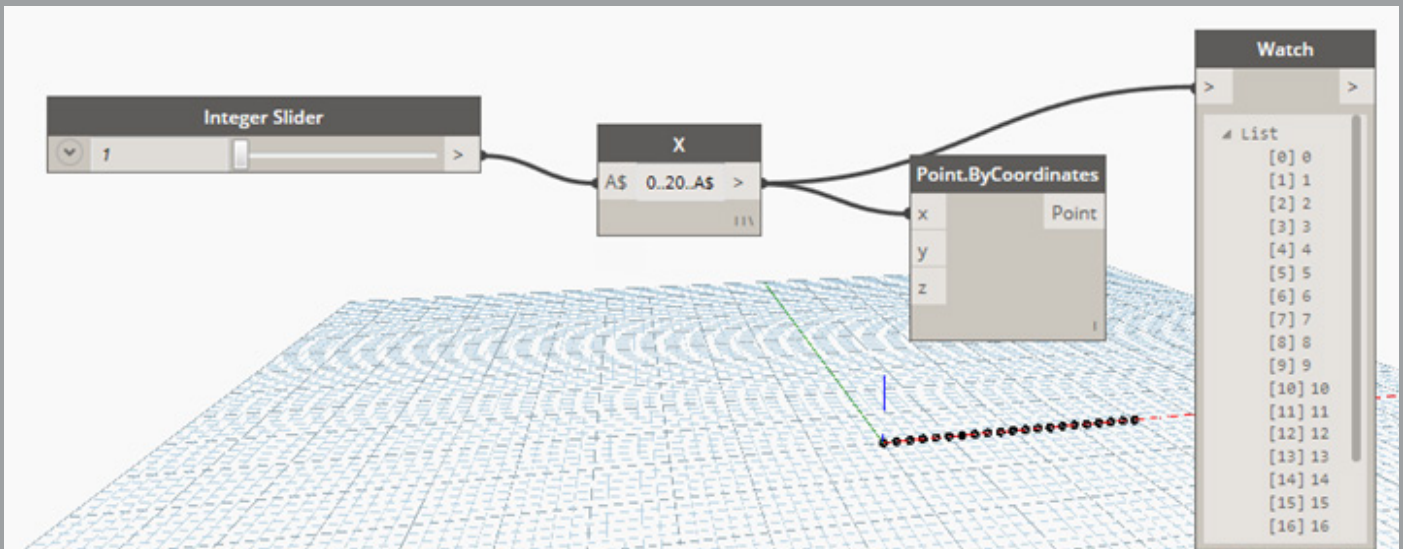


12. After practicing placing the points & making lists of those points we will simplify this thing a little to do other operations.

13. You can now delete the coordinates of the X,Y,Z and keep only the X coordinates

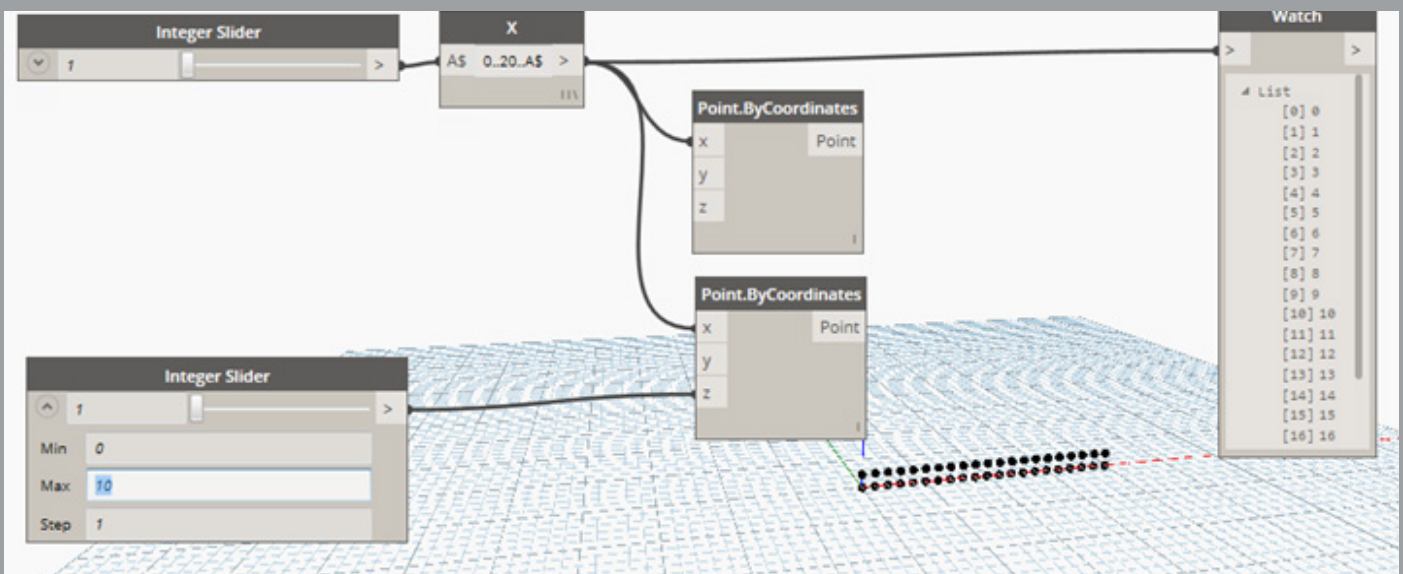


14. We will now copy another set of points that we made using Ctrl+C then Ctrl+V



15. The new set of points will not appear because it's in the same place as the older set

16. We will now change the new set of points place by putting a Slider with variable number on Z-Axis



17. We can set a maximum limit to the number on Z-axis, for example make it 10 and by changing the number we will find 2 rows of points above each other as shown in previous picture and We can control the space between them by changing the indicator number.

18. Making 2 parallel rows of points can be useful in many other orders & operations like making 2 rows of spheres as per previous lesson for example or using them to make parallel lines (that's what we will do in the next step)

19. We search in the side bar for the order **LINE** and chose the line type to be **ByStartPointEndPoint**.

ByStartPointEndPoint
Creates a straight Line between two input Points.
Line + Geometry

ByBestFitThroughPoints
Creates a Line best approximating a scatter plot of Points.
Line + Geometry

ByControlPoints (points)
Create a BSplineCurve by using explicit control points. NOTE 1: BSplineCurves with deg=1 have G1 discontinuities, which cause...
NurbsCurve + Geometry

ByControlPoints (points, degree)
Create a BSplineCurve by using explicit control points. NOTE 1: BSplineCurves with deg=1 have G1 discontinuities, which cause...
NurbsCurve + Geometry

ByControlPoints (points, degree, closest)
Create a BSplineCurve by using explicit control points. NOTE 1: BSplineCurves with deg=1 have G1 discontinuities, which cause...
NurbsCurve + Geometry

Creates a straight Line between two input Points.

Integer Slider

INPUT
startPoint : Point
endPoint : Point

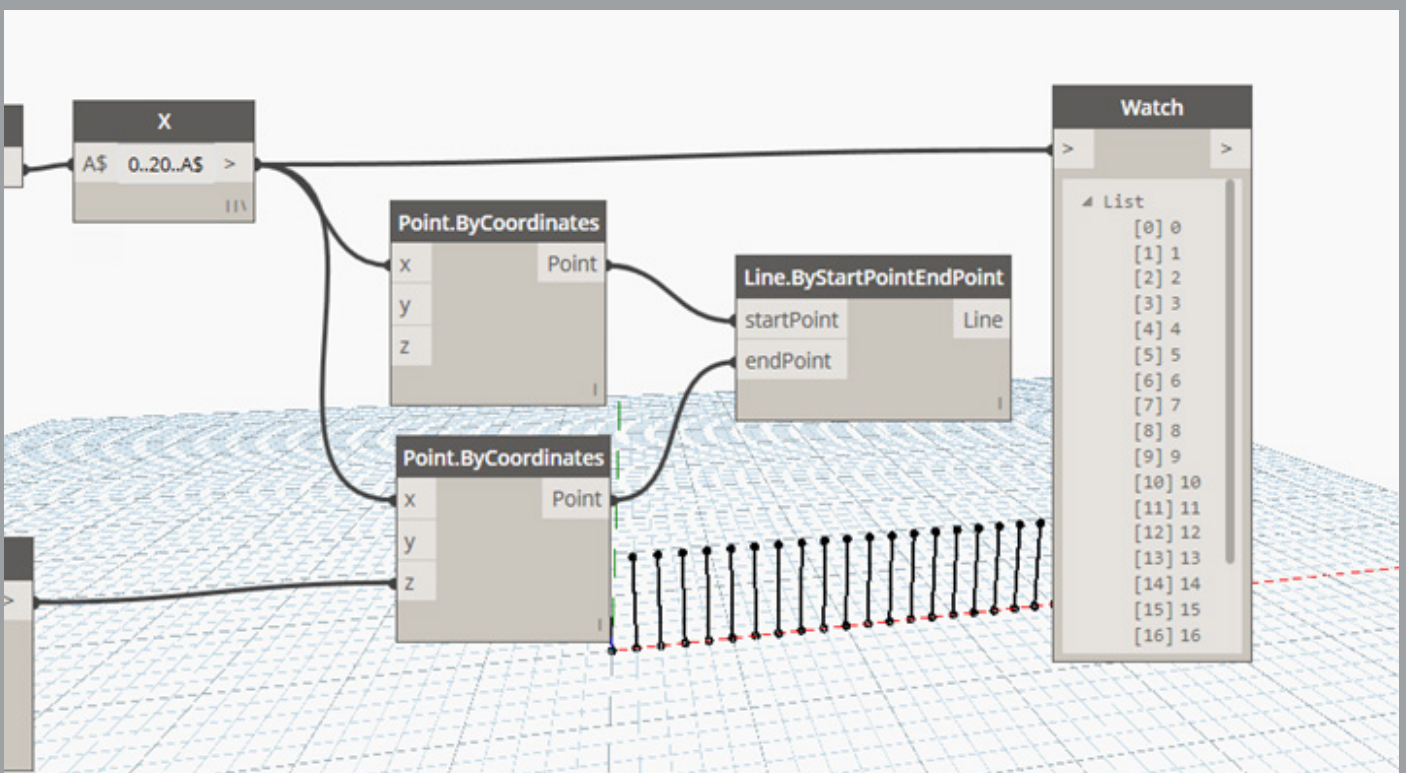
OUTPUT
Line

Integer Slider

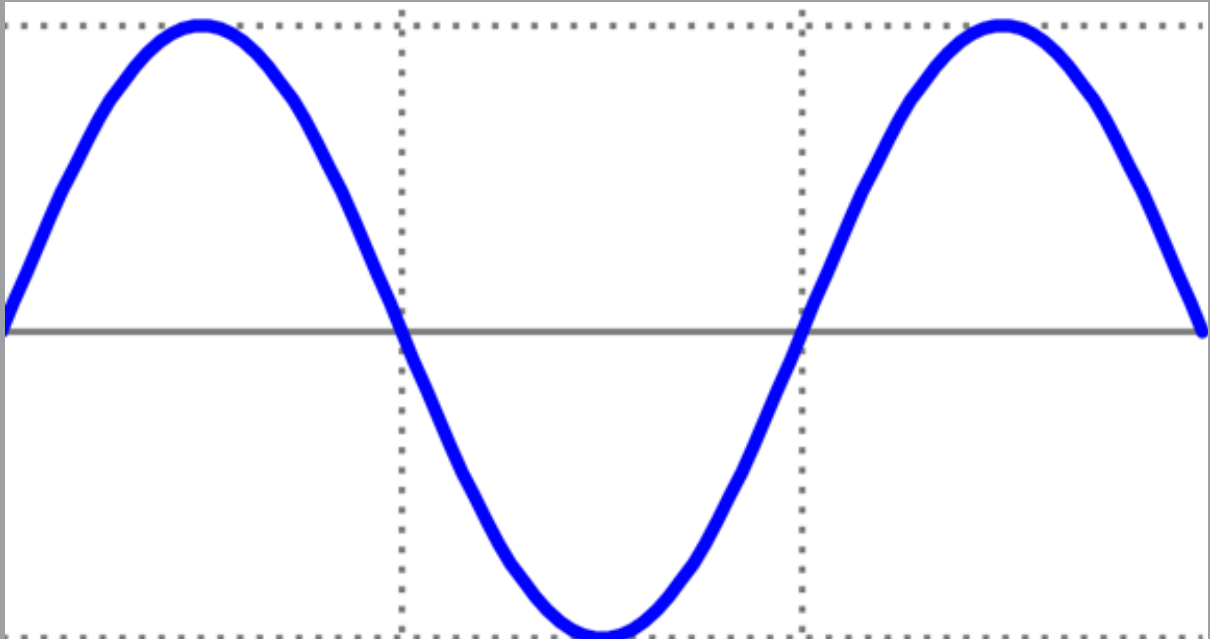
4

Min 0
Max 10
Step 1

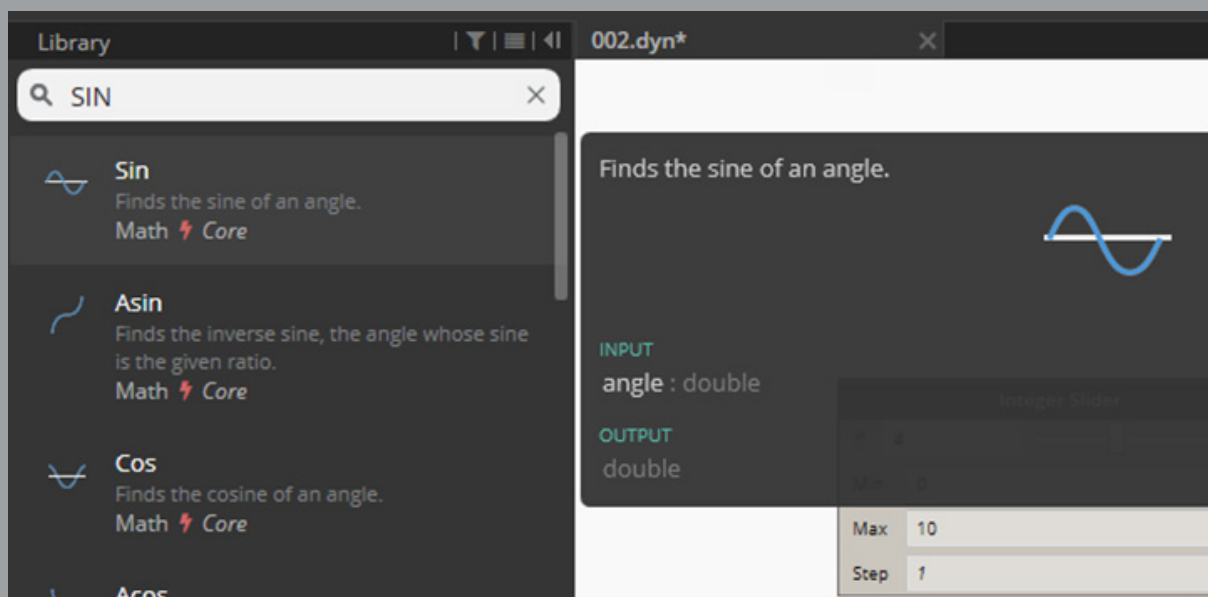
20. We connect the 1st set of points in the START & the 2nd set of points in the END as showing in the picture & we will notice the set of lines that may represent columns or a pattern on a frontage of a building.



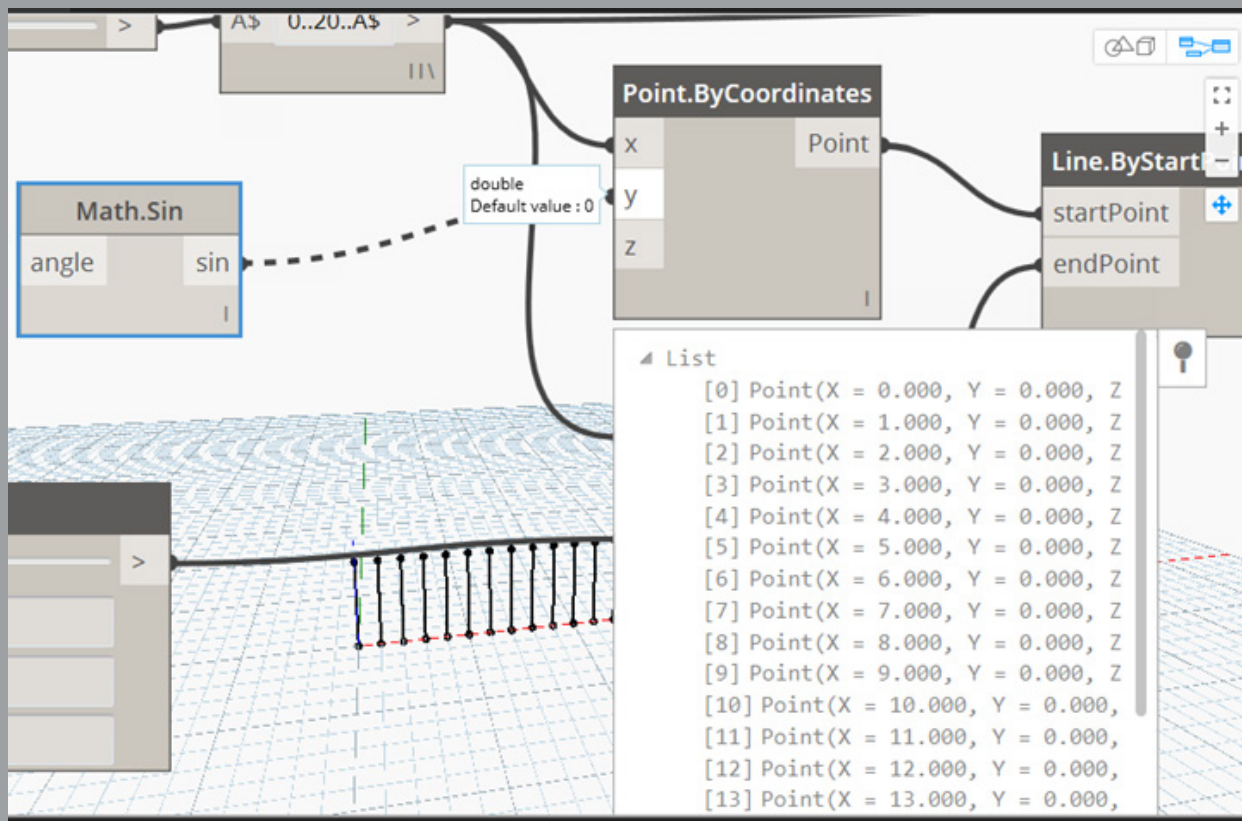
21. One of the dynamo advantages is the ability to use a lot of advanced mathematical relationships & entering it in the BIM world and we all know the famous mathematical relationship (function) called the SIN CURVE



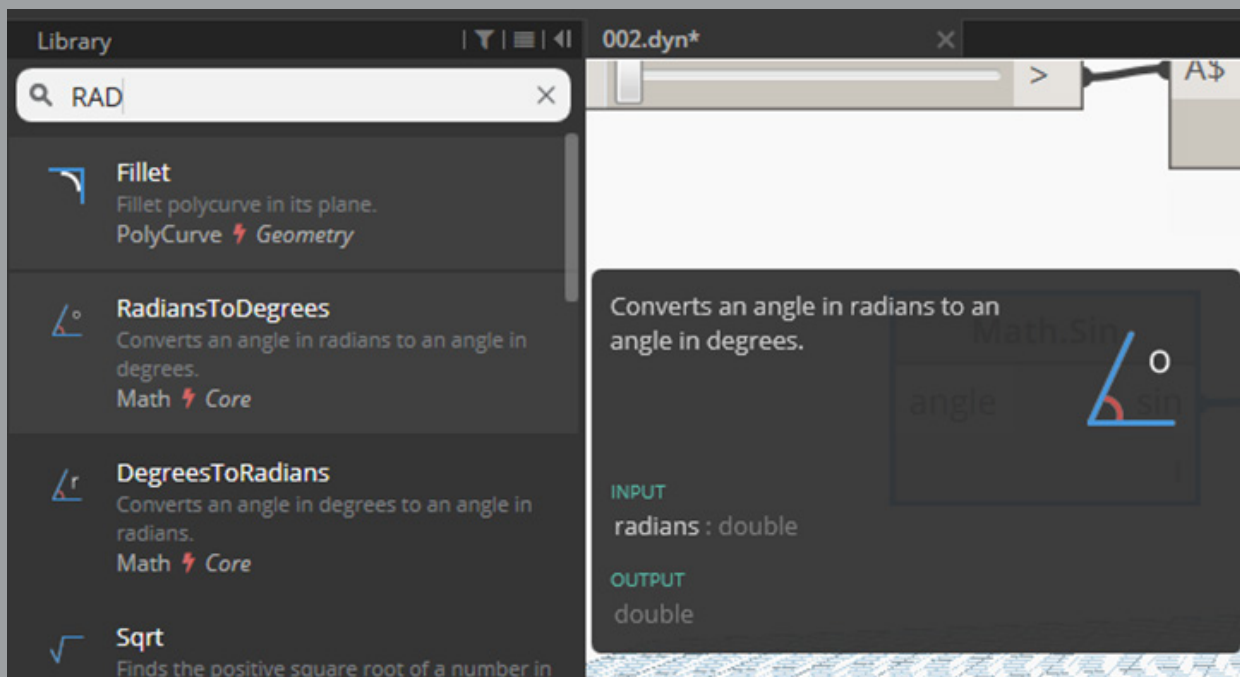
22. Search for the SIN CURVE



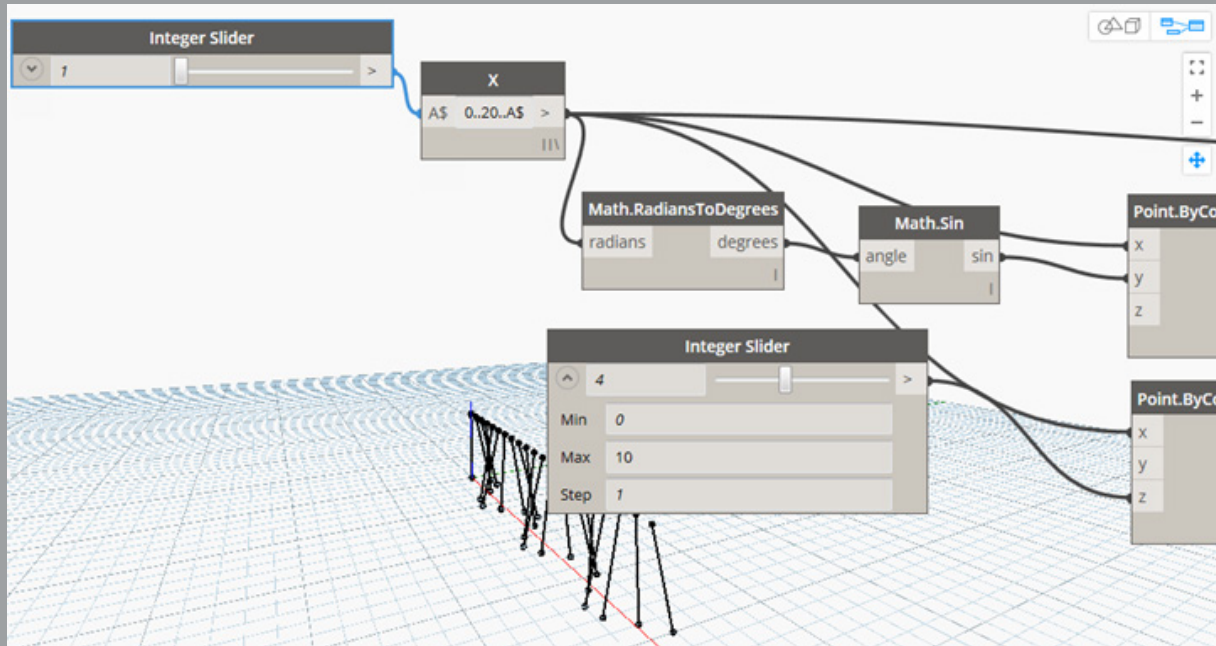
23. We can connect the SIN CURVE one Y-axis to the 1st set of points which means that the points in the low row will change in the Y-axis to shape the SIN CURVE



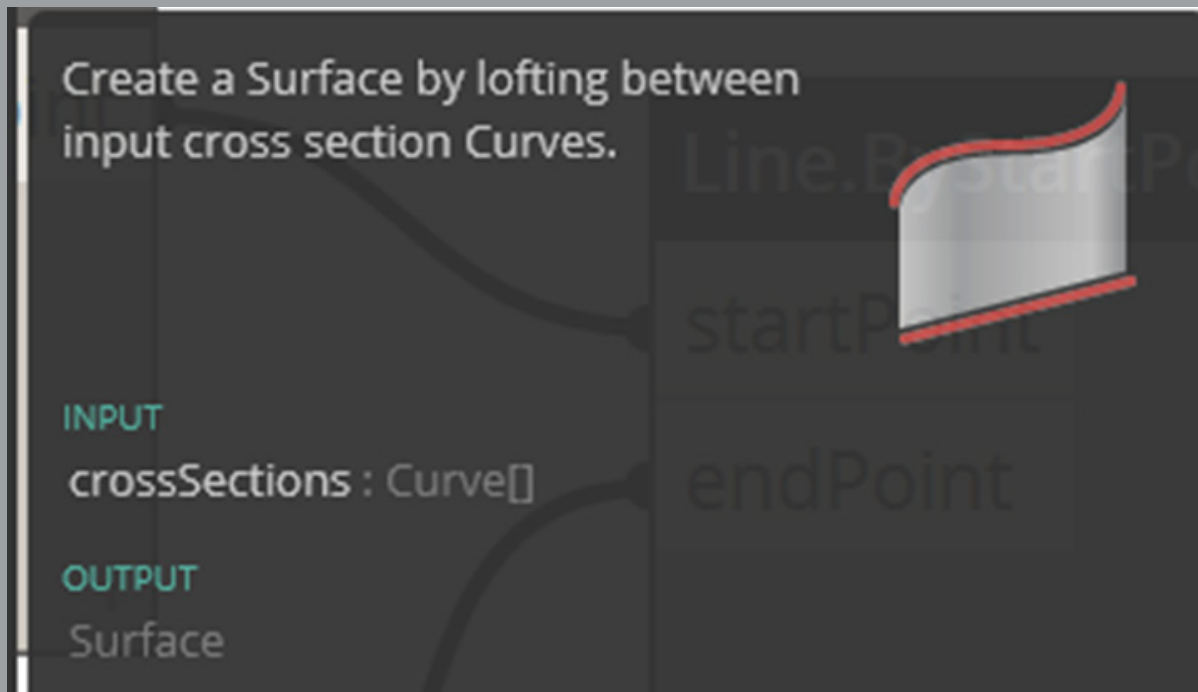
24. To control the angles of the SIN CURVE we can put a (convertor) to convert the radians numbers to degrees numbers called RadiansToDegrees node as shown



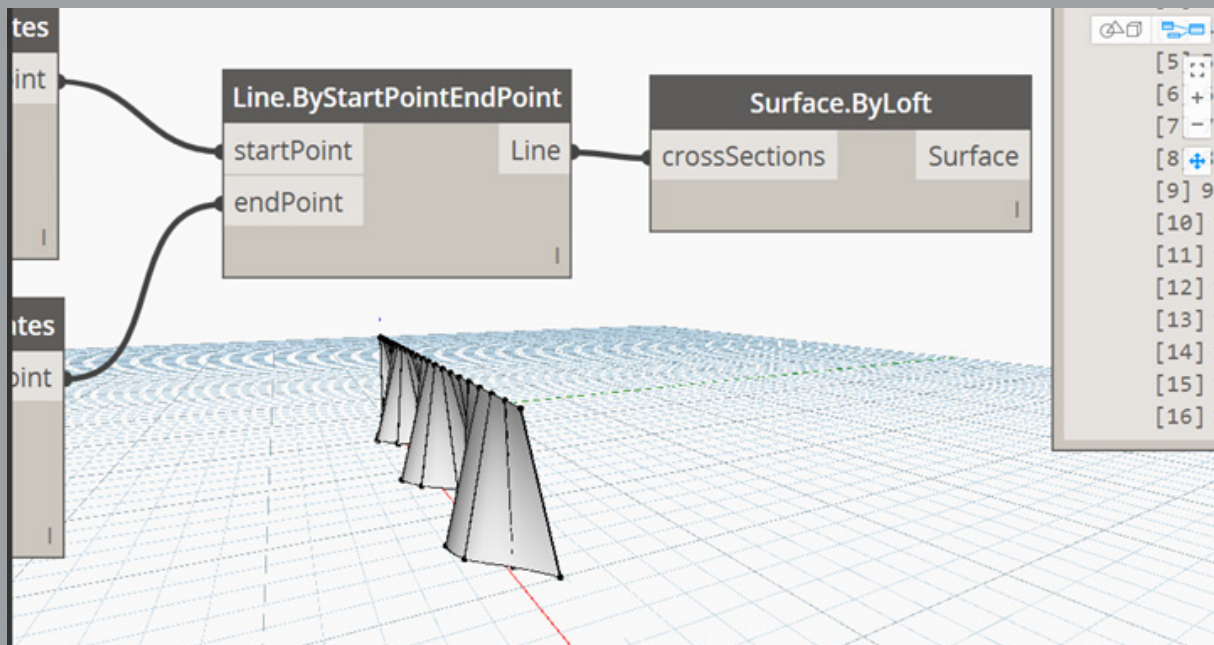
25. Now we can convert the points of X-Axis on the RADIANT SYSTEM to Angles to make the shown lines



26. We can make use of these lines in many duties & operations like making surfaces by connecting them using the order ByLoft (CROSS SECTIONS) and this order works by connecting lines to make surfaces

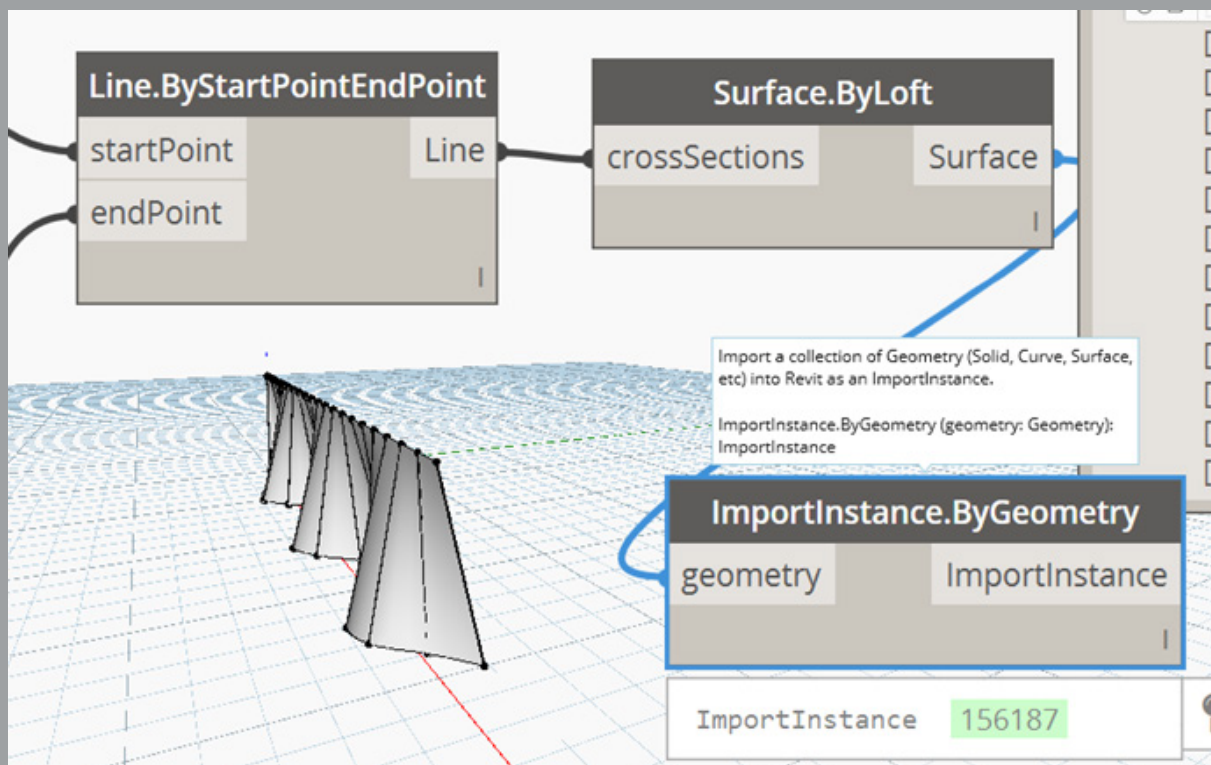


27. We can connect the previous lines by this order as showing in the following picture



28. Now we can enter this shape to the Revit.

29. It's simple we will search for an order called ImportInstanceGeometry node the order responsible to enter the resulting shape to be entered in the Revit



30. After this tour in Dynamo it's important to have curiosity to explore the other orders & try to identify its specifications , benefits and how to use them and see you in the next lesson.

I do not want to repeat the explication of the meaning of LOD in which our teachers have already preceded us in the pages of our beloved magazine BIMARABIA or on our various sites that we benefit from, foreign or Arab. For example, the blog of Omar Salim:

(<https://draftsman.wordpress.com>). But this article tends to explain some special meanings.

There are two meanings of LOD:


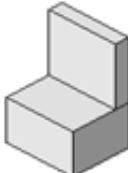


The first is Level of Development and the other is Level of Details

The first is the stages of development of the product or the extent of development and availability of information for the product (the product here in our article is meant by the BIModel), the second meaning is the details of the product in general, especially in the areas of manufacturing.

We do not only care about the amount of detail in our field (BIM), but also how these details influence on the model we are working on.

Words in the LOD






LEVEL of DETAIL

G0	G1	G2	G3
			
Schematic	Concept	Defined	Rendered
DESCRIPTION: Office Chair WIDTH: 700 DEPTH: 450 HEIGHT: 1100 MANUFACTURER: Herman Miller, Inc. MODEL: Mirra	DESCRIPTION: Office Chair WIDTH: 700 DEPTH: 450 HEIGHT: 1100 MANUFACTURER: Herman Miller, Inc. MODEL: Mirra	DESCRIPTION: Office Chair WIDTH: 700 DEPTH: 450 HEIGHT: 1100 MANUFACTURER: Herman Miller, Inc. MODEL: Mirra	DESCRIPTION: Office Chair WIDTH: 700 DEPTH: 450 HEIGHT: 1100 MANUFACTURER: Herman Miller, Inc. MODEL: Mirra

(based on AEC [UK] BIMprotocol v2.0 - Component Grade)

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LEVEL of DEVELOPMENT

LOD 100	LOD 200	LOD 300	LOD 400	LOD 500
				
Concept (Presentation)	Design Development	Documentation	Construction	Facilities Management
DESCRIPTION: Office Chair WIDTH: 700 DEPTH: 450 HEIGHT: 1100 MANUFACTURER: Herman Miller, Inc. MODEL: Mirra LOD: 100	DESCRIPTION: Office Chair WIDTH: 700 DEPTH: 450 HEIGHT: 1100 MANUFACTURER: Herman Miller, Inc. MODEL: Mirra LOD: 200	DESCRIPTION: Office Chair WIDTH: 700 DEPTH: 450 HEIGHT: 1100 MANUFACTURER: Herman Miller, Inc. MODEL: Mirra LOD: 300	DESCRIPTION: Office Chair WIDTH: 685 DEPTH: 430 HEIGHT: 1085 MANUFACTURER: Herman Miller, Inc. MODEL: Mirra LOD: 400	DESCRIPTION: Office Chair WIDTH: 685 DEPTH: 430 HEIGHT: 1085 MANUFACTURER: Herman Miller, Inc. MODEL: Mirra PURCHASE DATE: 01/02/2013

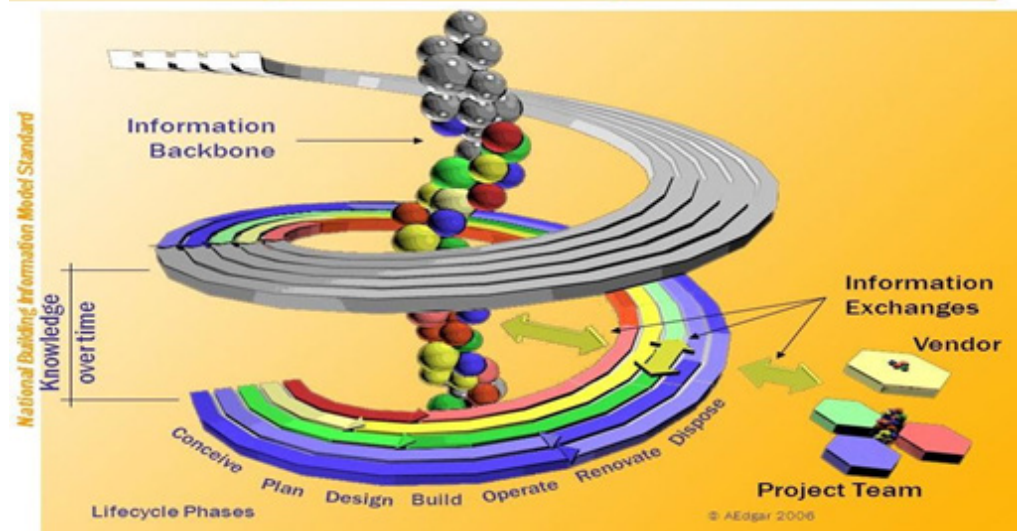
(Only data in red is useable)

practicalBIM.net © 2013

For example, when creating or using a family for an air conditioning FCU, we do not care about its color but we care about its size, Invert Elevation, its mechanical and electrical loads, its various calculations and its serial number in the catalog to determine its type and number during the preparation of the purchase order from the supplier. We don't care about the color because it is mounted above the ceiling and the customer does not deal with it. Nevertheless, the factory is interested in color owing to its effect on the consumption of material from its stock and the purchase orders for the colors used in manufacturing, thus this illustrates the difference between the above mentioned meanings.

LOD 100 Conceptual	LOD 200 Approximate geometry	LOD 300 Precise geometry	LOD 400 Fabrication	LOD 500 As-built
				
The Model Element may be graphically represented in the Model with a symbol or other generic representation , but does not satisfy the requirements for LOD 200. Information related to the Model Element (i.e. cost per square metre, etc.) can be derived from other Model Elements.	The Model Element is graphically represented in the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation.	The Model Element is graphically represented in the Model as a specific system, object, or assembly accurate in terms of quantity, size, shape, location, and orientation.	The Model Element is graphically represented in the Model as a specific system, object, or assembly that is accurate in terms of quantity, size, shape, location, and orientation with detailing, fabrication, assembly, and installation information .	The Model Element is a field verified representation accurate in terms of size, shape, location, quantity, and orientation.
	Non-graphic information may also	Non-graphic information may also	Non-graphic information may also	Non-graphic information may also

Therefore, we find that the LOD report or table is a description of the progress of the various details in it, and to understand this we imagine that we collect a visual data structure as the backbone of the human, so the more the amount and type of details and required information, the more progression in construction of the model and that allows us to move from a stage of development to another one (LOD 100, 200, 300, ... etc.) . It is not, however, a vertical building like the construction of multi-stories building but quantitative with qualitative growth. In the previous example, when adding a specific color to the FCU, it does not increase or diminish the necessary information for the required Family, but adding the serial number and specifying its catalog is a necessary qualitative growth. Increasing the required details increases the progress of the development of the model, based on the development of information throughout all stages of the model.



The processing of the LOD table within the model or in an annex determines the level of development of this model, whether it is in the WIP stage (Work in Progress)-a preliminary work stage in the model in which the designer is not interested in accurate details or calculations and is not paid, either it is in the stage of the design based on information and values of the actual calculation, or in the stage of Shop Drawing and the operational plans for the team in the site, or is in the stage of As-Build Drawing to transfer information implemented to the model so that the implementation would be in full conformity with the mode. The LOD versions are then combined with the various versions of the model, starting from the mass-form phase to the phase of conformity between model and final implementation, through the coordination phase discussed earlier in our previous article in the sixth issue of our e-magazine BIMarabia, phase of material takeoff, and the Project Time Schedule.

We must agree and acknowledge that the secret recipe for successful work in the model is to monitor the documentary cycle provided by the LOD and other documents. The LOD table or report may be considered as a quality control document for the model. In accordance with specific criteria, the LOD table or report can describe the model's status, the level of its progress and its usefulness in the various stages of work, as well as our confidence in relying on its information.

After showing the meaning, function and extent of the importance of the LOD, it worths mentioning that this is not the only name used to explain this important procedure, and this is a review of some of the other titles used in some programs and platforms.

Vico software: “Model Progression Specification”
(US) AIA: “Model Element Table”
USACE: “Minimum Modelling Matrix” or “M3”
NatSpec: “BIM Object Element Matrix”
Veteran affairs (US): “VA Object Element Matrix”

Article Summary:

1. The difference between Level of Development and Level of Details
2. The difference between the amount of details and their importance
3. The more details are developed in the model, the more progress in the stages of evaluation
4. The LOD Table or Report is a quality control documents.
5. Review of some of the LOD names used

Mohamed Abdel Aziz Abdel Karim
Senior BIM Coordination



Mohamed Abdel Aziz
Senior BIM Coordination

Update Programs

The company “X” has downloaded a latest and greatest version of the program today, let us download, install and make best use of it now!

Well , before you download the latest version, did you know that there are companies in Japan (especially in accounting) so far working on the DOS system and did not move to Windows?? Certainly not preservation of heritage, Samurai didn't invent DOS!

Of the reasons that prompted them not to install any new update

- DOS system is more stable as operating system and less prone to viruses.
- Each update needs training and may not be worth the return.
- Do not waste time online or social networks.
- You will not need to develop hardware every year

The purpose is not to deny modernization, but to warn against

the pursuit of modernization without thinking, and we did not take advantage of 10% of the possibilities of the old version

When issuing a new version, read about it and where the best location of the company's source for the program and think: Do I strongly need these updates or is it just a propaganda sensation?

There are companies that did not develop their program, but they are issuing a more recent with an attractive name so people are out of breath to develop and buy while it is a copy of the old version with marginal changes in shape, cover but not in function.

The newer version may be worse than the old version, as in the Vista version, which was subsequently discontinued

So you have to read and study before downloading any copy and ask yourself is there any advantage I really need in my work?

There may be an advantage of exporting to the CNC and is a feature I did not need before in my work so I do not find the enthusiasm to install a more recent version and to waste time.

Important warning of trying the new version on your projects files, try a copy of them in location far from the working files, when applying an update to some of the projects or opening it with a copy of the latest version, you will find that the files have problems such as changing in the size of fitting (pipes).

If you find a feature in the new version, can you remain using the older version (such as AutoCAD can save the board on older versions) and will saving via version make you losing any advantages such as reducing space?

Suppose you cannot save on an old file format , and there are advantages you need.

Are you updating your current projects, or you will complete the work with the current version and the new projects start working in the latest version? You need to study options well before making a decision.

Will you need to buy the software or not?

Prefer not to rush and buy the program before testing and make sure it will benefit the company, you can obtain a trial license for limited period or the possibilities of restriction, such as not to print or not to export.

When buying software there is a trick made by the software companies that are convincing you that you need their programs and then convince you that you will not find a substitute for their programs

and this is why you find the prices of the programs are superstitious.

You can get the program at tenth price if you succeed in negotiations with the seller that you know several alternatives (many programs have free alternatives and open source) and you can switch to the alternative if he insists on the exaggerated price.

Well, how about switching from one program to another? There are many factors that may impress you to do this, such as moving to a company that is running a specific program or the client is required to work with a specific program

At the beginning of my work in BIM, I worked for a company working with MagiCad and then I went to another company working with Revit, I joined them so it makes no sense to work stray about the herd.

The factors may be optional such as company development.

Well, you have to try the program first, you may work with an old project of which you know the result and do comparison.

You may find more recent program that gives different or wrong results or there is a lack of factors.

There may be another better alternative, you have to compare the alternatives and you may do a small project using both. For example, the first issue of BIMArabia was edited in Photoshop. The modification was difficult and took way too long time so we decided to look for an alternative and shortlisted the

most famous programs specialized in editing magazines.

MS Publisher vs InDesign

Perusing online researches, we found InDesign better and there was semi-consensus

Then I asked Professor Samar Subhi, who is an expert in the field, and recommended using on InDesign and so we did.

Note that we did not change for the sake of changing, but the nature of the work and the exhaustion forced us to find a replacement easier and stronger.

Another example is that one of the companies has an architectural project and wants to implement BIM and has a team that is fluent in AUTOCAD and in studying alternatives it was better to work on AUTOCAD architecture because it is closer to their previous knowledge and time is not allowing to learn Revit or Archicad.



The group meets monthly at Qatar University to talk about developments in the field of BIM, which develops daily and in a way that makes us eager to follow up everything new.

The benefit of these meetings, which we hope to spread everywhere and in all specialties, is to meet the specialists and exchange information, an hour with an expert may be more blessing than a month isolated.

Our meeting this month was about developments in two programs, Autodesk InfraWorks 360 for roads and infrastructure, and Revit for buildings due to the release of 2017 version as usual in mid-April

The meeting started with the Engineer Allen Jay Holland to welcome and introduce lecturers.

Then engineer Mohammed Abu Asali began with definition for Autodesk InfraWorks 360 program and the extent of easiness and new additions in version 2017 being a dedicated program for roads and infrastructure.

After this spoke Eng Hani Shabana (structural engineer at Autodesk) about developments in Revit 2017 and how it's become more efficient in use.

There are special developments in reinforcement with Revit structure. And developments in Steel Connections and FABRICATION with Revit MEP

The meeting was useful and fruitful and we interacted and reaped many benefits from it.

Doha BIM Users Group

Written by: Omar Selim

The Lookup Tables file is important for those who work in electrochemical discipline.

It controls the size of FITTING and is a comma-separated values (CSV) file that opens with Excel, as shown in follow:

	A	B	C	D	E	F
1		ND##length##inches	FDia##length##millimeters	FThk##length##millimeters	FID##length##millimeters	
2	4	4	229	19	102	
3	5	5	254	19	127	
4	6	6	279	19	152	
5	8	8	343	19	203	
6	10	10	406	22.2	254	
7	12	12	483	25.4	305	
8	14	14	533	28.6	356	
9	16	16	597	28.6	406	
10	18	18		31.8		
11	20	20		31.8		
12	24	24		34.9	610	
13	30	30		38.1	762	
14	36	36	1168	41.3	914	
15	42	42	1346	44.5	1067	

The first column- only for the order-unimportant, the second column has values such as the 2-inch pipe

The rest of the columns have the associated values such as the internal and external ELBOW diameter

result=size_lookup(LookupTableName, LookupColumn, DefaultIfNotFound, LookupValue1, LookupValue2, ..., LookupValueN)

Well, the problem always comes from the fact that the fitting is not linked to the Lookup Tables file, so the FITTING is too large or too small

Tables Lookup

The solution

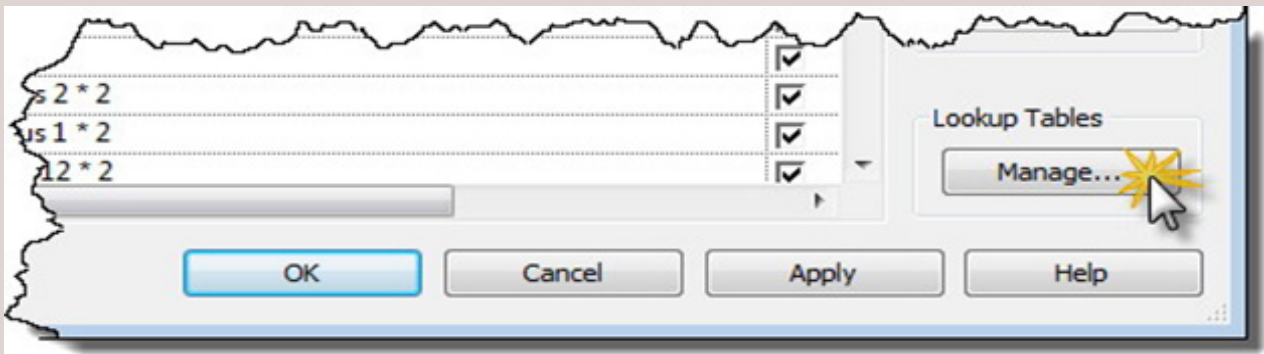
First, know the name of the associated table from the edit type of the Fitting. you will find a Lookup table

Now select the fitting and choose edit family

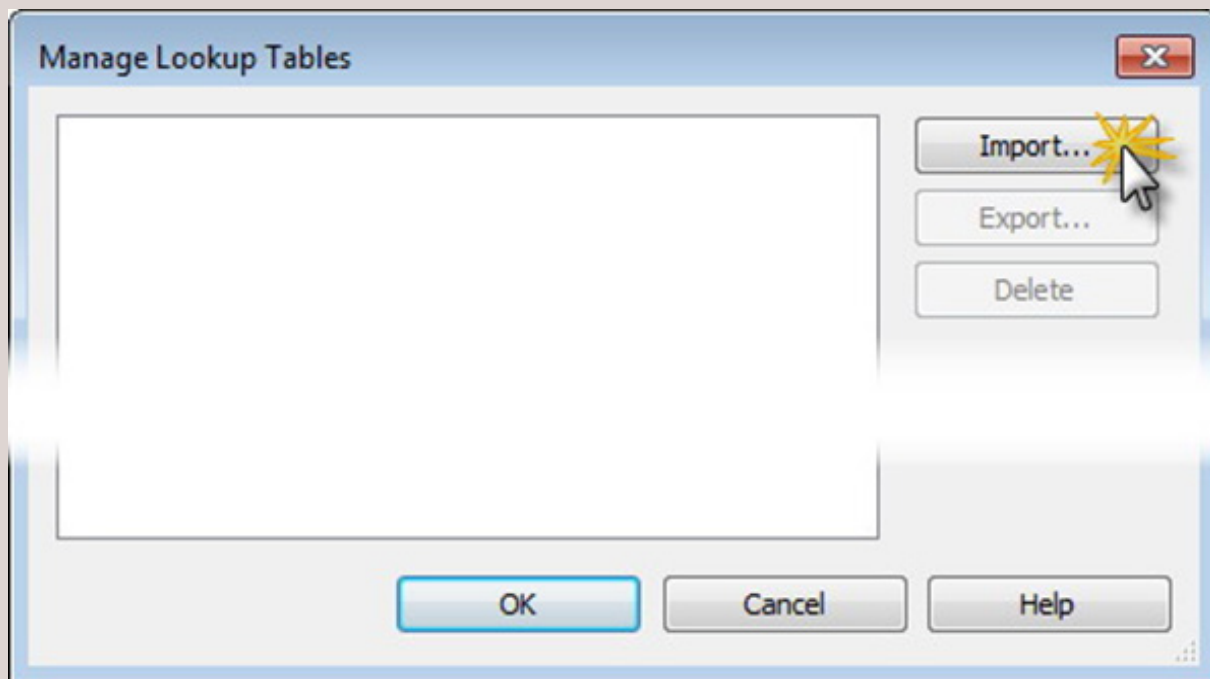
Then family type

You'll find a special part of the lookup table

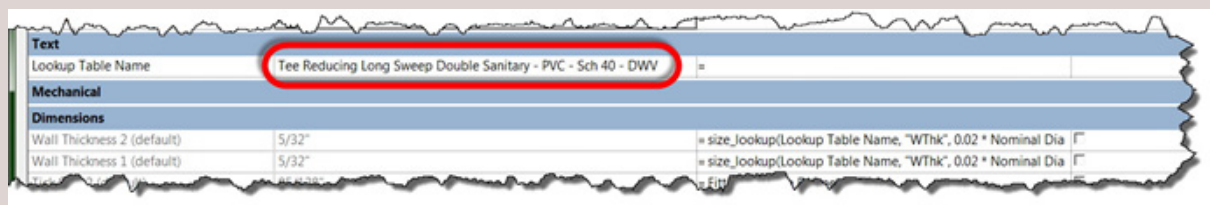
Press manage



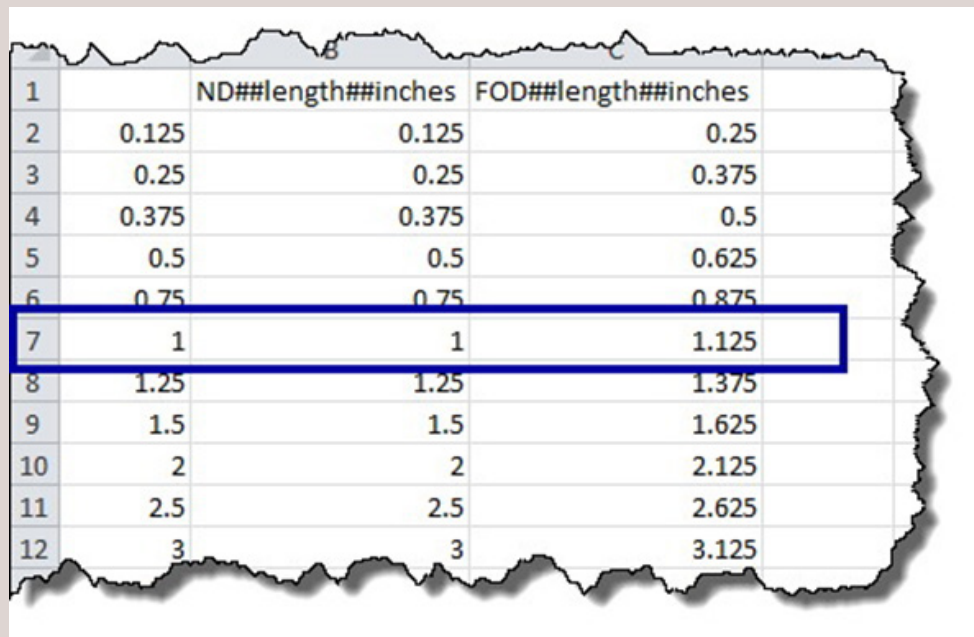
Then press import to insert the file inside the family



You'll find the name of your table



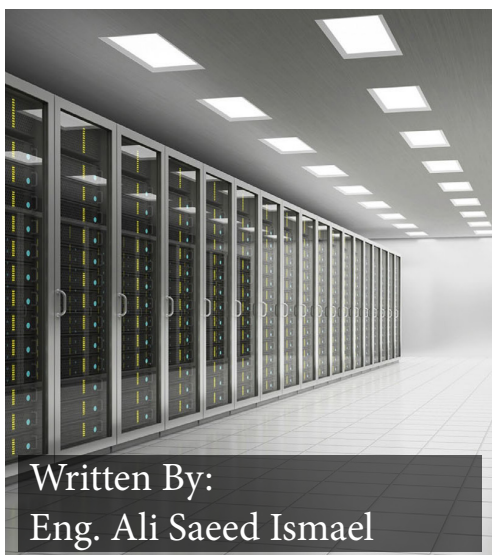
You can open the file at any time and modify it



1	ND##length##inches		FOD##length##inches	
2	0.125	0.125	0.25	
3	0.25	0.25	0.375	
4	0.375	0.375	0.5	
5	0.5	0.5	0.625	
6	0.75	0.75	0.875	
7	1	1	1.125	
8	1.25	1.25	1.375	
9	1.5	1.5	1.625	
10	2	2	2.125	
11	2.5	2.5	2.625	
12	3	3	3.125	



Written By:Omar Selim



Written By:
Eng. Ali Saeed Ismael



IFCWebServer

Online Data Model Server and Viewer for BIM
models based on IFC Standards

Ali Ismail Msc.

Development leader

IFCWebServer.org

Dealing with engineering models based on IFC format using IFCWebServer

Part One

Introduction

What distinguishes BIM's engineering models from the previous generation of 2D or 3D engineering design models, is its view of the building as a group of intelligent elements which have special properties and relationships between each other, rather than purely geometric forms. There is no doubt that easy access to the data contained in the models of engineering constructions is very important for many tasks assigned to the project manager or to the design team. For example, it is possible to check the quality of the data related to the various elements, create different reports to calculate quantities or filter items by

their characteristics to obtain partial models that meet specific objectives such as structural analysis or energy consumption calculations.

Therefore, the effective data access and interchange between different people who often use different design programs or different versions of the same program is a major challenge and continues to cause a lot of problems as a result of the need to re-create the data or the loss of part of it, not getting it in time or difficulty in checking the availability and quality of the required information.

To solve the problem of data interoperability, the Industry Foundation Classes (IFC) play an important role within a single project using

different design and analysis programs. Files are interchanged through the export and import of data periodically or through archiving the final engineering models of the buildings for many years while ensuring access to their content.

IFC files are known as text files and can be previewed using text file preview software. However, the structure of these files and the complex relationships between their components make it difficult to access the data contained within them. This is why it is important to use specialized programs to convert them to easier formats such as Excel tables or databases, or better by using IFC Servers or BIM Servers.

This article will not address the definition of IFC format or the importance of its use, but will explain how to use this standard format to access the various data contained in the modules designed with programs in accordance to IFC-Format to generate reports and validate data. This article is the first part of a series of articles explaining how to use www.ifcwebserver.org, which provides easy access to data within geometrical models based on the IFC standard format.

About the project of IFCWebServer.org

Work on this project began in 2011 to provide a flexible way to extract data from engineering building models and make them available for specialized engineering project management programs through simulation technology. These data included structural elements such as columns, slabs, walls, information on their area, total size and location within the building and the materials used to construct it.

The language used to write the code is the Ruby language, which is flexible and high productive by focusing on solving the problem and writing a code shorter and easier to read than those written by other languages such as Java or C ++. The work was then developed and converted from a local computer program to an integrated server **IFC Server** with an easy-to-use interface. The project consists of two main sections:

- (1) Data server for engineering models (BIM Data Server), based on the IFC format: www.ifcwebserver.org
- (2) A 3D browser with web GL technology, through which the building models can be viewed directly using modern web browsers and easily shared with others. www.bimviewer.com

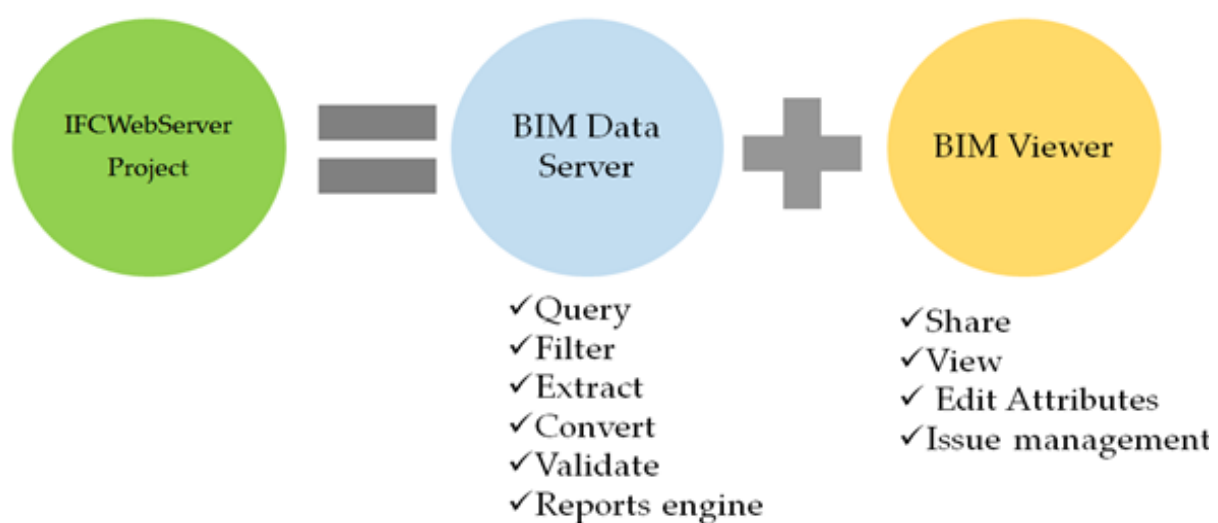


Figure 01: Relationship data server building models and 3D data browser

IFC Web Server can be used to perform the following tasks:

- Share building models with others and make them available online
- Explore 3D models through the Internet without the need for specialized programs.
- Preview and edit properties of geometric elements
- Create reports according to the user's requirement for different data within BIM models.
- Extracting partial models of the entire model - for example, for one story - for the bearing construction elements only.
- Compare different geometrical models of the structure and find differences between them.
- Verify the quality of data within engineering models.

Scientific researchers and developers can also use the site to develop special data exchange tools or to develop additional IFC extensions by defining new classes using EXPRESS language or writing Ruby scripts to automate some tasks.

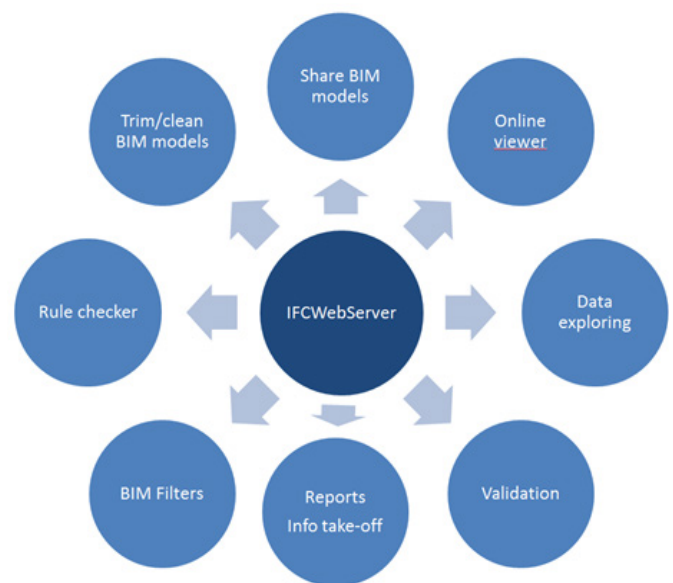


Figure 02: Benefits of Using IFC Web Server

In this article we will explain the following points:

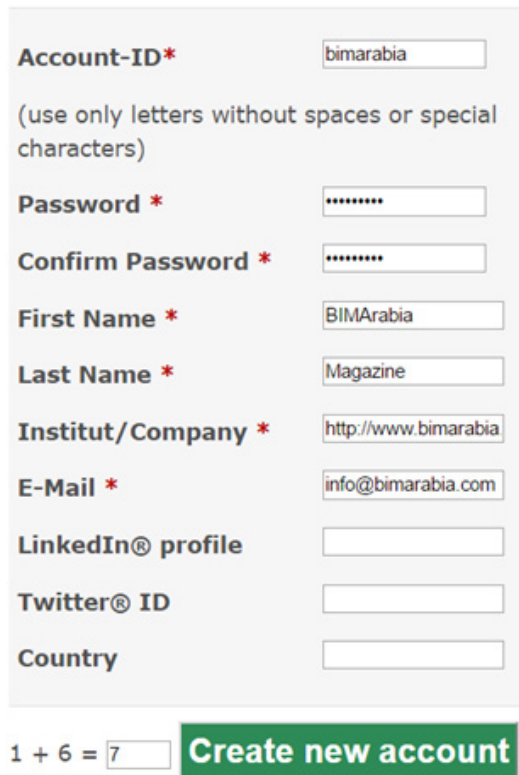
- Create a personal account on the site
- Download BIM's models in IFC format
- Preliminary review of the content of engineering model
- Review the pyramid structure of construction
- Perform simple queries
- Create a simple report

Create a personal account

It is done through the page <http://ifcwebserver.org/login.rb?q=register>

It is important in this step to use the correct information and to do attention that typing the user name in Latin characters without containing special symbols or spaces.

Register a new account



Account-ID*

(use only letters without spaces or special characters)

Password*

Confirm Password*

First Name*

Last Name*

Institut/Company*

E-Mail*

LinkedIn® profile

Twitter® ID

Country

1 + 6 = [Create new account](#)

Figure 03: Registration page for the site

The username we created is BIMArabia and password is also BIMArabia and can be used to apply the examples in this article. After registration, access to the site can be done through the user name and password

[Http://ifcwebserver.org/login.rb?q=login](http://ifcwebserver.org/login.rb?q=login)

On the login page, the user can also choose one of the designs available for the home page: Default, Simple, and BIM Reporter



Login

Account-ID:

Password:

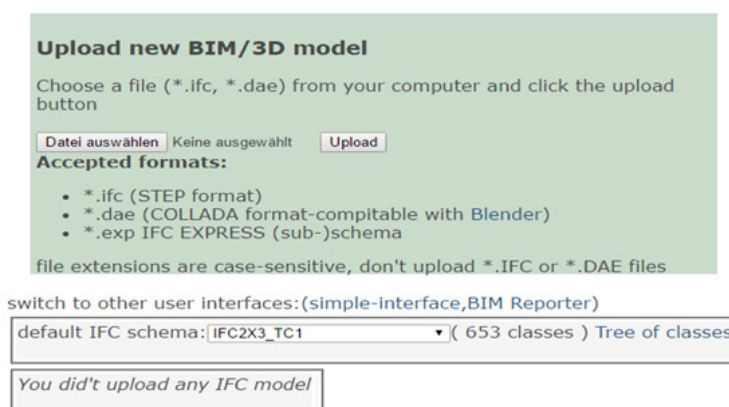
User Interface:

or [Create a free account](#)

Demo Account: Account-ID: **user1** Password: **123**

IFC WebServer

[Browse BIMs](#) | [Upload](#) | [Viewer](#) | [MVDs](#) | [Scripts](#) | [Extensions](#) | [IfcDoc](#) |



Upload new BIM/3D model

Choose a file (*.ifc, *.dae) from your computer and click the upload button

Keine ausgewählt

Accepted formats:

- *.ifc (STEP format)
- *.dae (COLLADA format-compatible with Blender)
- *.exp IFC EXPRESS (sub-)schema

file extensions are case-sensitive, don't upload *.IFC or *.DAE files

switch to other user interfaces: (simple-interface, BIM Reporter)

default IFC schema: (653 classes) [Tree of classes](#)

Download BIM models in IFC format

After registering and logging in successfully, the user can download IFC files by clicking the Upload link on the home page

Figure 04: download page of IFC file

In this article we will use the files of one of the projects available for free on the Internet, which can be obtained from the following page:

https://www.nibs.org/?page=bsa_commonbimfiles

We will choose Project 2. Office Building and download the IFC Formats files through the following link:

http://projects.buildingsmartalliance.org/files/?artifact_id=4284

And then download the architectural, construction and mechanical design:

- Office_A_20110811_optimized.ifc
- Office_S_20110811_optimized.ifc
- Office_MEP_20110811_optimized.ifc

Review the content of the engineering model

Once the files have been downloaded, the user can start browsing their content or making queries and creating reports with the various data they contain. The files can be viewed in 3D, the data may be extracted about the properties of elements and saved in a special database. This process may take some time in the case of large engineering models. Due to limited project resources, files are not processed simultaneously on the site server. Figure 05 shows the main user interface after downloading the three models and selecting the architectural design file from the list of available models in **BIM models**.

At first glance, the interface may look a bit complicated but designed to allow quick access to data.

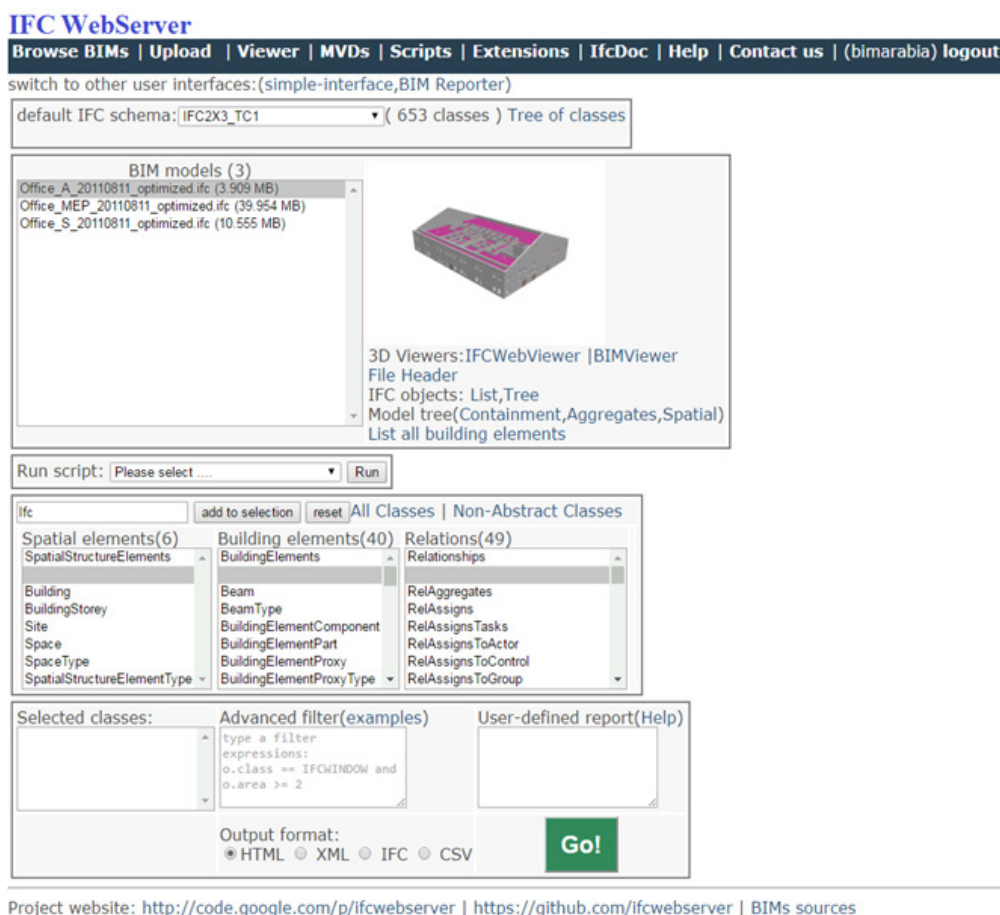


Figure 05: The main user interface after loading the three models

We notice the following links for each model: File header, List, Tree, Model Tree
 Using the link Browse BIMs we get a table of all the engineering models that have been loaded and quick links to access them and review them as shown in the following form:

All BIMs | IFC WebServer

Select a BIM Model: All BIM models

BIMs_List




ID	Preview	Model	Size (MB)
1	 <div>View</div>	Office_MEP_20110811_optimized Objects list Objects Tree	39.954
2	 <div>View</div>	Office_S_20110811_optimized Objects list Objects Tree	10.555
3	 <div>View</div>	Office_A_20110811_optimized Objects list Objects Tree	3.909

Figure 06: Table of loaded geometric patterns

When you click on an image of any template, you will be redirected to the home page
 Clicking on the link View opens the engineering model to view it in 3D

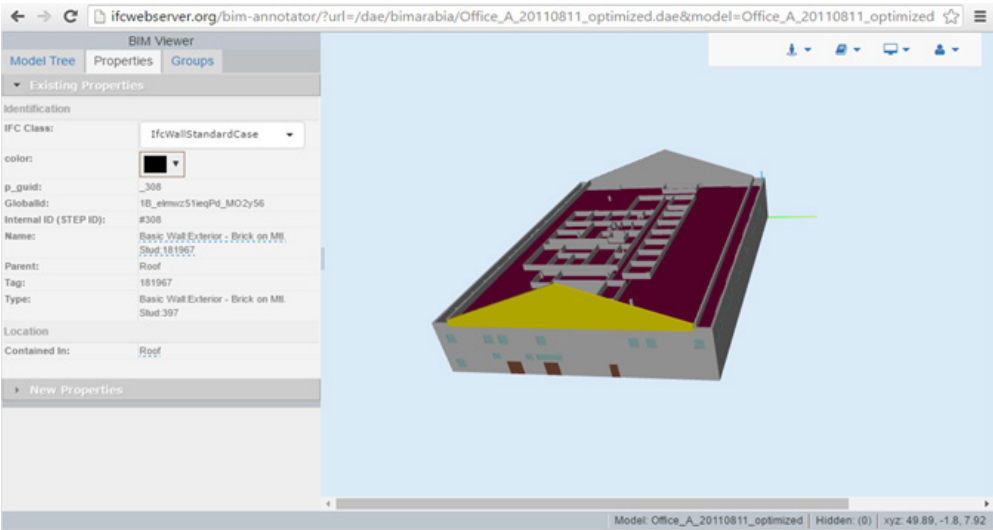


Figure 07: Preview the properties and size of files

The user can preview the form and when selecting an item, a list of related information will appear with the possibility of modifying it or adding new information. When you select one of the two following menus (objects list - objects tree), you get a detailed table or a hierarchical tree for all the elements within the form and their numbers and quick links to get a list of elements according to its type as shown in the next figure.

ID	Class Name	Parent Class ↑	File1	Operations
	Objects Number		62930	
1	IfcApplication	Ifc	1	html xml
98	IfcUnitAssignment	Ifc	1	html xml
83	IfcRepresentationMap	Ifc	55	html xml
66	IfcPresentationStyleAssignment	Ifc	24	html xml
65	IfcPresentationLayerAssignment	Ifc	10	html xml
60	IfcPersonAndOrganization	Ifc	1	html xml
59	IfcPerson	Ifc	1	html xml
58	IfcOwnerHistory	Ifc	1	html xml
57	IfcOrganization	Ifc	2	html xml
54	IfcMeasureWithUnit	Ifc	1	html xml
53	IfcMaterialLayerSetUsage	Ifc	11	html xml
51	IfcMaterialLayer	Ifc	26	html xml
49	IfcMaterial	Ifc	11	html xml
25	IfcDimensionalExponents	Ifc	1	html xml
24	IfcCurveStyleFontPattern	Ifc	4	html xml
23	IfcCurveStyleFont	Ifc	3	html xml
52	IfcMaterialLayerSet	Ifc	9	html xml
64	IfcPostalAddress	IfcAddress	1	html xml
4	IfcArbitraryProfileDefWithVoids	IfcArbitraryClosedProfileDef	22	html xml
7	IfcBooleanClippingResult	IfcBooleanResult	4	html xml
97	IfcTrimmedCurve	IfcBoundedCurve	23	html xml
15	IfcCompositeCurve	IfcBoundedCurve	1	html xml
62	IfcPolyline	IfcBoundedCurve	2114	html xml
21	IfcCurveBoundedPlane	IfcBoundedSurface	103	html xml
27	IfcDoor	IfcBuildingElement	102	html xml
20	IfcCovering	IfcBuildingElement	83	html xml
88	IfcSlab	IfcBuildingElement	2	html xml
72	IfcRailing	IfcBuildingElement	10	html xml
91	IfcStairFlight	IfcBuildingElement	4	html xml
100	IfcWindow	IfcBuildingElement	69	html xml
90	IfcStair	IfcBuildingElement	2	html xml
55	IfcMember	IfcBuildingElement	8	html xml

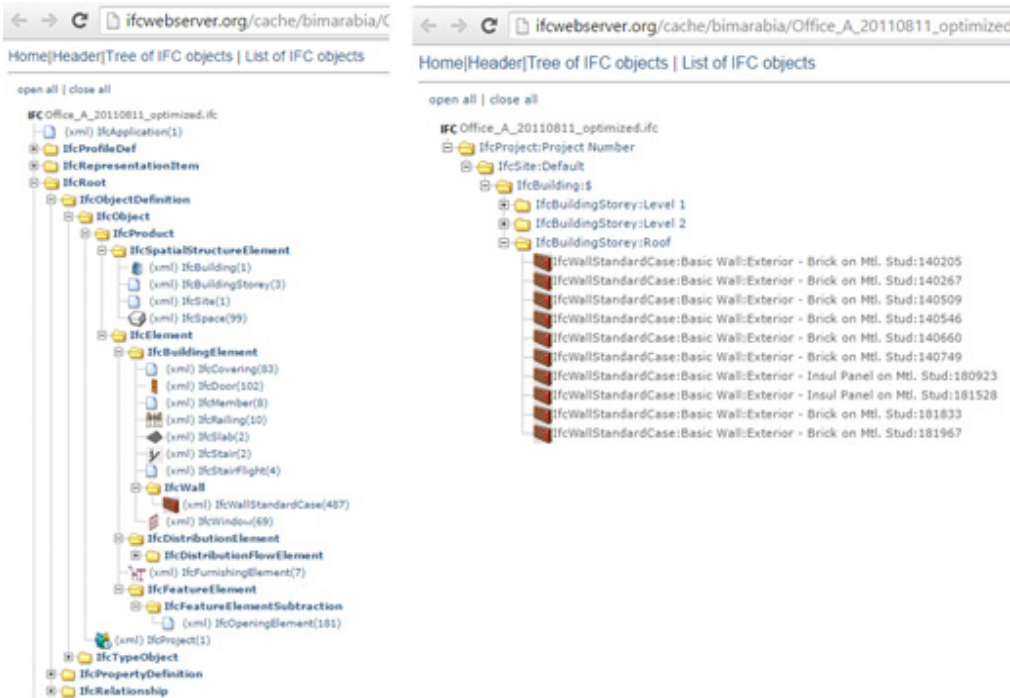


Figure 08: A detailed table of all items in the form via one of both lists

ifcwebserver.org/ifc.rb?ifc_file=Office_A_20110811_optimized.ifc	
Home Header Tree of IFC objects List of IFC objects Model Tree	
Office_A_20110811_optimized.ifc	
FILE_DESCRIPTION	Value
Description	ViewDefinition [CoordinationView]
Implementation_level	2;1
FILE_NAME	
Name	Project Number
Time_stamp	2011-08-11T14:18:13
Author	
Organization	
Preprocessor_version	Autodesk Revit Architecture 2011 - 1.0
Originating_system	Solibri IFC Optimizer
Authorization	
FILE_SCHEMA	
Schema_identifiers	IFC2X3

You can also view the information contained in an IFC file that contains important information such as the name of the program from which the file was exported, the information about who owns the file rights or the IFC version that was used.

It is worth mentioning that many commands can be easily accessed by typing the link directly within the Internet browser after logging in using the following formula:

[http://ifcwebserver.org/ifc.rb?ifc_file=\[filename\]&q=\[name of command\]](http://ifcwebserver.org/ifc.rb?ifc_file=[filename]&q=[name of command])

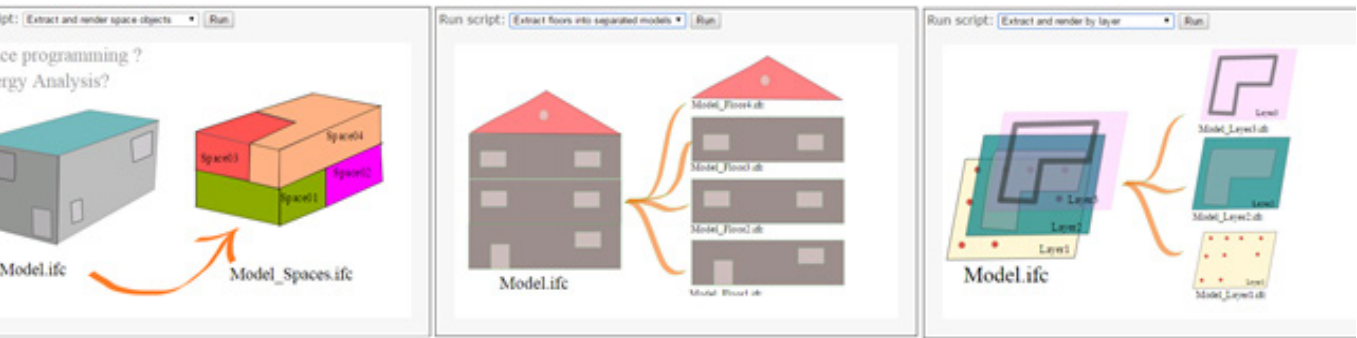
The following table lists some commands

Command	Information
,	A table with information about the header of the file
&q=objects_list	A table that lists the various elements contained in the file by type of item
&q=tree	A hierarchical tree for file content according to the hierarchical structure of the IFC file system
&q=model_tree	A hierarchical tree of the building structure (project - building - floor - area - elements)
&q=IFCSLAB, &q=IFCCOLUMN, &q=IFCBUILDING, &q=IFC?????	Quick access to a table containing the basic information about the elements by its type (tile, column, building, etc.)

We also note that the main interface contains the following part:



Which allows the user to execute commands that are grouped together in the form of a script to perform specific tasks. Currently, this list contains three options that allow to get: partial models according to the layers of elements (Layers), partial files for each floor in the building, or a partial file containing the three-dimensional shapes of the rooms (Spaces), which may be needed, for example, in case of analyzing the energy consumption of the building.

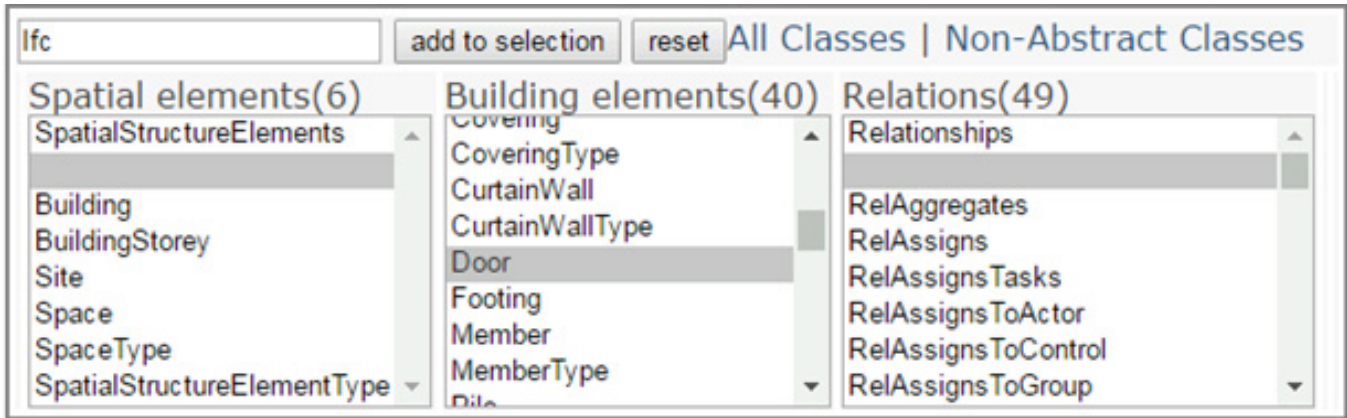


In the next sections, we will explain how to write similar scripts based on the script of these examples.

Perform a simple search

As an example: how to do a bitmap search for a list of the doors in the architectural design model?

We choose the Architectural Design Model and then choose **Door** from the menu of Building Elements and press **GO** button as shown in Figure:



Note that it is possible to select several types of elements at the same time (columns, tiles, windows, floors, Column, Slab, Windows, Building Storey) can also query the relations between elements. At this point, we will only have a simple example of a list of all the doors. The lower section allows you to define filters to be applied to items and to show items that meet the conditions of these filters only. For example, to get the doors that exceed certain dimension. It also allows you to choose the information you want to appear in the table instead of showing all the basic information by default. It can also determine the format you want to get for the result of the query. We will address all these options through practical examples in the following parts, God willing

Selected classes:

Advanced filter(examples)

type a filter
expressions:
o.class == IFCWINDOW and
o.area >= 2

User-defined report(Help)

Output format:
☒ HTML ☐ XML ☐ IFC ☐ CSV

Go!

After clicking GO, the following result appears

Office_A_20110811_optimized.ifc

IfcDoor

Ifc > IfcRoot > IfcObjectDefinition > IfcObject > IfcProduct > IfcElement > IfcBuildingElement > IfcDoor (102) (download as xml)

ID	description	globalId	line_id	name	objectPlacement	objectType	overallHeight	overallWidth	representation	tag	details
1	\$	'2N3ofIM8XG02dN1\$7x1u'	457	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:184606	IfcLocalPlacement(36209)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39131)	'184606'	
2	\$	'1h7yfpbf0qppP_pQnt_R'	458	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:190705	IfcLocalPlacement(36349)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39083)	'190705'	
3	\$	'1h7yfpbf0qppP_pQnt_rV'	459	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:191221	IfcLocalPlacement(36233)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39118)	'191221'	
4	\$	'2N3ofIM8XG02dN1\$77x06'	460	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:184835	IfcLocalPlacement(36471)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39133)	'184835'	
5	\$	'2N3ofIM8XG02dN1\$77x0R'	461	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:184701	IfcLocalPlacement(36157)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39132)	'184701'	
6	\$	'2N3ofIM8XG02dN1\$77xRk'	462	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:186248	IfcLocalPlacement(36043)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(38950)	'186248'	
7	\$	'2N3ofIM8XG02dN1\$77xkJ'	463	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:187125	IfcLocalPlacement(36526)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39143)	'187125'	
8	\$	'1h7yfpbf0qppP_pQnt_R'	464	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:189829	IfcLocalPlacement(36441)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39078)	'189829'	
9	\$	'2N3ofIM8XG02dN1\$77x7o'	465	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:184468	IfcLocalPlacement(36419)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39126)	'184468'	
10	\$	'3If4otxpvBJJC9DSa\$5K\$uj'	466	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:207624	IfcLocalPlacement(36682)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39366)	'207624'	
11	\$	'2N3ofIM8XG02dN1\$77xw'	467	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:187210	IfcLocalPlacement(36528)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(38955)	'187210'	
12	\$	'2N3ofIM8XG02dN1\$77x0N'	468	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:185137	IfcLocalPlacement(36417)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39049)	'185137'	
13	\$	'2N3ofIM8XG02dN1\$77xR'	469	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:186281	IfcLocalPlacement(36084)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39138)	'186281'	
14	\$	'2N3ofIM8XG02dN1\$77x06'	470	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:184864	IfcLocalPlacement(36400)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39134)	'184864'	
15	\$	'2N3ofIM8XG02dN1\$77x0J'	471	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:186187	IfcLocalPlacement(35984)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(38949)	'186187'	
16	\$	'1h7yfpbf0qppP_pQnt_6x'	472	M_Single-Flush:0915 x 2134mm:0915 x 2134mm:189969	IfcLocalPlacement(36174)	'0915 x 2134mm'	2.134	0.915	IfcProductDefinitionShape(39079)	'189969'	

IfcDoor

```
lfc (abs)
├─ lfcRoot (abs)
├─ lfcObjectDefinition (abs)
├─ lfcObject (abs)
├─ lfcProduct (abs)
├─ lfcElement (abs)
├─ lfcBuildingElement (abs)
└─ lfcDoor

Class attributes:
GlobalId
OwnerHistory
Name
Description
ObjectType
ObjectPlacement
Representation
Tag
OverallHeight
OverallWidth

Class INVERS attributes:
HasAssignments
IsDecomposedBy
Decomposes
HasAssociations
IsDefinedBy
ReferencedBy
HasStructuralMember
FillsVoids
ConnectedTo
HasCoverings
HasProjections
ReferencedInStructures
HasPorts
HasOpenings
IsConnectionRealization
ProvidesBoundaries
ConnectedFrom
ContainedInStructure
```

Note that we have obtained a table containing the basic information for the doors: GlobalId, Name, Description, ObjectType, ObjectPlacement, Representation, Tag, OverallHeight, and OverallWidth according to the specifications of this class within the IFC specification as shown below

[Http://ifcwebserver.org/onfly_doc.rb?schema=IFC2X3_TC1&class=IFCDOOR](http://ifcwebserver.org/onfly_doc.rb?schema=IFC2X3_TC1&class=IFCDOOR)

We do not get inverse attributes or other properties that are defined by property sets. We will see later an example of how to get the rest of the properties related to the doors through the use of BIM Reporter design instead of the virtual interface.

Create reports through BIM Reporter

We pass to simplified design to get tabular reports with associated elements and properties through the link <http://ifcwebserver.org/reporter>

In this case, when the user selects an engineering model, the menu of Select IFC classes will be updated to include only the categories already in the form and the number of copies of each category. When selecting a category, for example the doors, the menu of Add report field will be updated to include a list of all basic and reverse properties, as well as a list of the property sets associated with the doors within the model. The fields we wish to add are added by double clicking on them. We can also add conditions to filter data in the field of Filter expression.

In this example we chose the following fields:

Name, GlobalId, tag, OverallHeight, OverallWidth

The three sets of characteristics are:

As the figure shows:

Then click Run Report to get the following report

Office_A_20110811_optimized.ifc									
IfcDoor									
Ifc = IfcRoot > IfcObjectDefinition > IfcObject > IfcProduct > IfcElement > IfcBuildingElement > IfcDoor > (102) (download as xml)									
Nr	name	globalId	tag	overallHeight	overallWidth	pset(Pset_DoorCommon)	pset(Pset_Revit_Type_Materials and Finishes)	pset(Pset_Revit_Type_Dimensions)	
1	M_Single-Flush-0915 x 2134mm-0915 x 2134mm-184600	2N3vFMX0G02Dn1577x1u	184600	2.134	0.915	Pset_DoorCommon: Reference: Flush-0915 x 2134mm IsExternal: false FireRating: Fire Rating	Pset_Revit_Type_Materials and Finishes: Door Material: Door - Panel Frame Material: Door - Frame	Pset_Revit_Type_Dimensions: Thickness: 0.051 Height: 2.134 Trim Projection Ext: 0.025 Trim Projection Int: 0.025 Trim Width: 0.076 Width: 0.915	
2	M_Single-Flush-0915 x 2134mm-0915 x 2134mm-190705	1h7yFpM0agP_pQnL_R	190705	2.134	0.915	Pset_DoorCommon: Reference: Flush-0915 x 2134mm IsExternal: false FireRating: Fire Rating	Pset_Revit_Type_Materials and Finishes: Door Material: Door - Panel Frame Material: Door - Frame	Pset_Revit_Type_Dimensions: Thickness: 0.051 Height: 2.134 Trim Projection Ext: 0.025 Trim Projection Int: 0.025 Trim Width: 0.076 Width: 0.915	
3	M_Single-Flush-0915 x 2134mm-0915 x 2134mm-191221	1h7yFpM0agP_pQnL_V	191221	2.134	0.915	Pset_DoorCommon: Reference: Flush-0915 x 2134mm IsExternal: false FireRating: Fire Rating	Pset_Revit_Type_Materials and Finishes: Door Material: Door - Panel Frame Material: Door - Frame	Pset_Revit_Type_Dimensions: Thickness: 0.051 Height: 2.134 Trim Projection Ext: 0.025 Trim Projection Int: 0.025 Trim Width: 0.076 Width: 0.915	

Summary

This article provides a quick definition of the IFCWebServer project, which allows handling of BIM models using the standard IFC format through examples of how to access data, conduct queries and create reports.

In the next issue, we will continue to explain how to make queries or reports in an easy way by writing special code to automate some tasks or to get reports as desired by the user.

I hope that this article will be an incentive for those who work in the field of BIM to read or understand the IFC standard and use it in real projects, and perhaps to use IFCWebServer or other tools to improve the quality of the engineering designs and raise the level of collaborative work in the engineering projects.

Note:

This article is updated and revised from time to time, please use the following link to read the latest revised version: https://docs.google.com/document/d/1e8TcCummWSiVlZGXhRivM1L-_i-Hfv2D-cnLnOX_NvI/edit?pref=2&pli=1

The idea of building the model for a building with all its details goes back to the 70s as we knew, and what made the idea a robust reality is the 70s is the rapid technological progress in the hardware and software.

Feller says in his Critical Path, that “knowledge took 1500 years to double from year 1 to year 1500 AD” .

That means it doubled only once in the sixteenth century AD, as it was «1» And became “2”. It took a long time to double, but as we said the curve of knowledge charts fast, that is the years required for doubling the knowledge will decrease with time. 250 years later knowledge doubled again, In 1750 it was «2» and became «4». After 150 years it was doubled again from “4” to “8” Until it has been doubling every 18 months only, according to Feller. Acceleration varies from domain to domain and from knowledge area to the other, but this figure is the general average. The duration is still decreasing and it is expected that in the near future knowledge doubles every 12 hours!

That is why we must be involved in making progress If we can not at least cope up to discipline on daily or even hourly basis and then get it translated, simplified, and explained.

Do not underestimate yourself or your effort, as you may translate one line talking about names of the best books, which in turn may get manipulated by another contributor who adds and contributes to making progress.

And do not let what is happening in our Arab world distract you from seeking knowledge

(Nor should the Believers all go forth together: if a contingent from every expedition remained behind, they could devote themselves to studies in religion, and admonish the people when they return to them,- that thus they (may learn) to guard themselves (against evil).(122)).

Says artist Hani El Masri, a former designer at Walt Disney and DreamWorks
“In the days of the Hyksos, there were Egyptians who loved science, loved art, and loved their country. All what this people did for 10 or 12 generations is just documenting and teaching science and art to their siblings and successors knowing that Egypt shall get back and definitely will .. even after 200 years. IThis could be our responsibility today; to stay hold on Egyptians of such kind. Egyptians in the time of the Hyksos. “
We ask God to bless in the little effort and accept His mercy and bounty.

Team Work:

Omar Selim

Eng. Sonia Ahmed

Eng. Motasem Albanna

Eng. Maisoon Alsorori

BIMarabia

8th Issue

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